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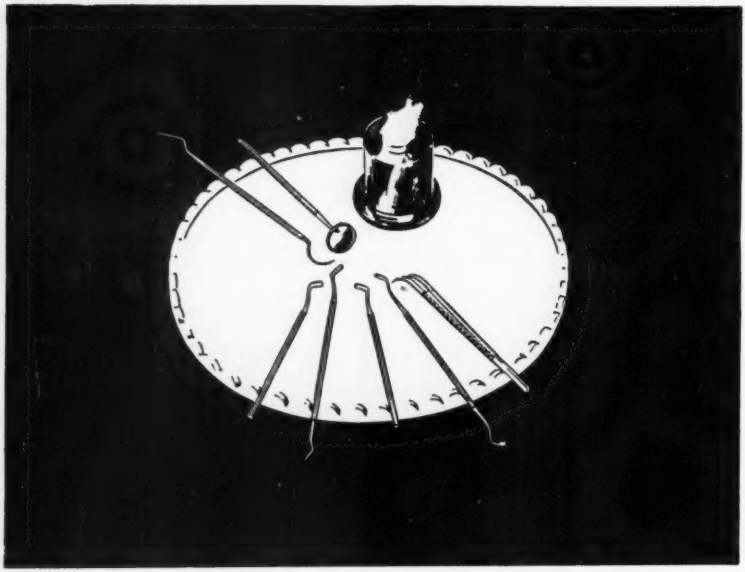

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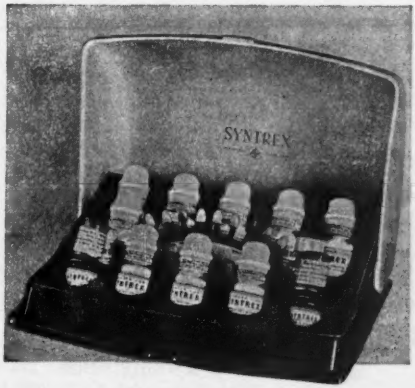

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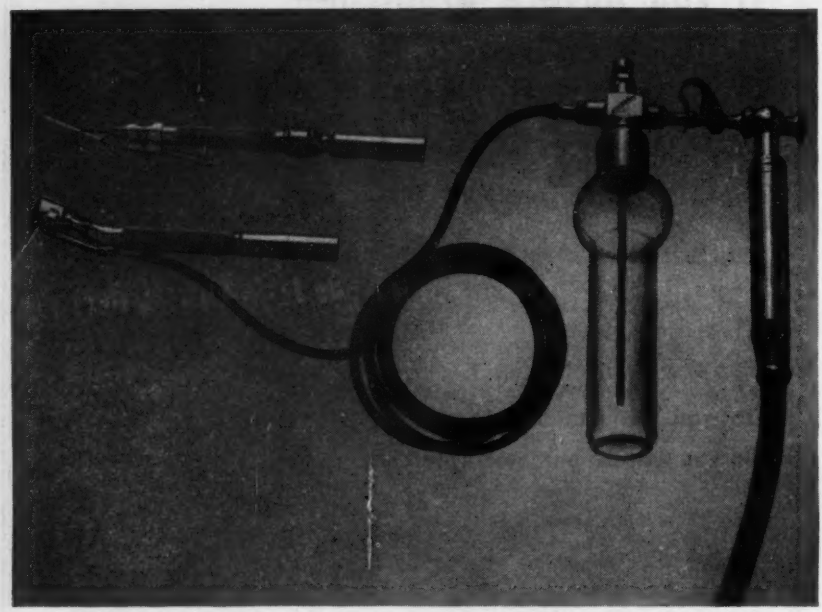

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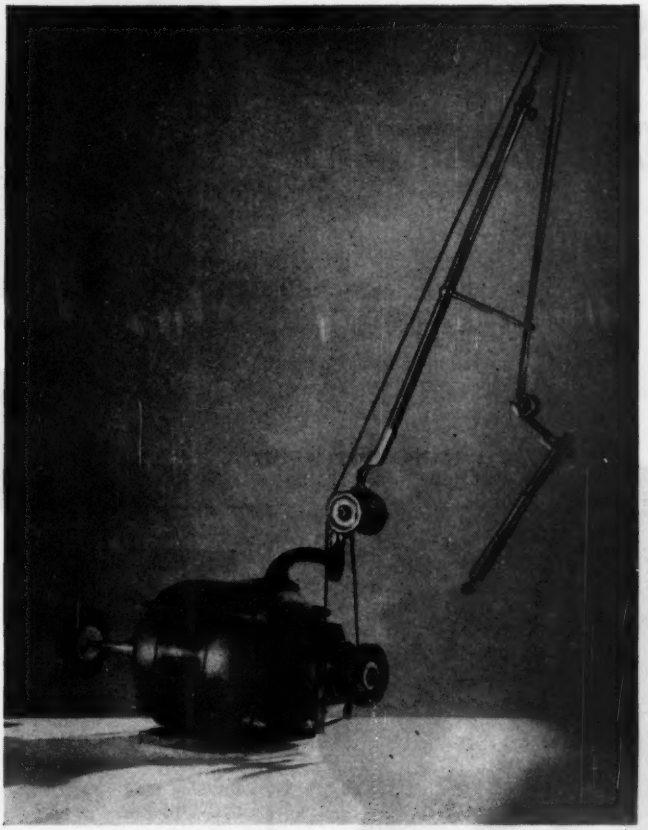

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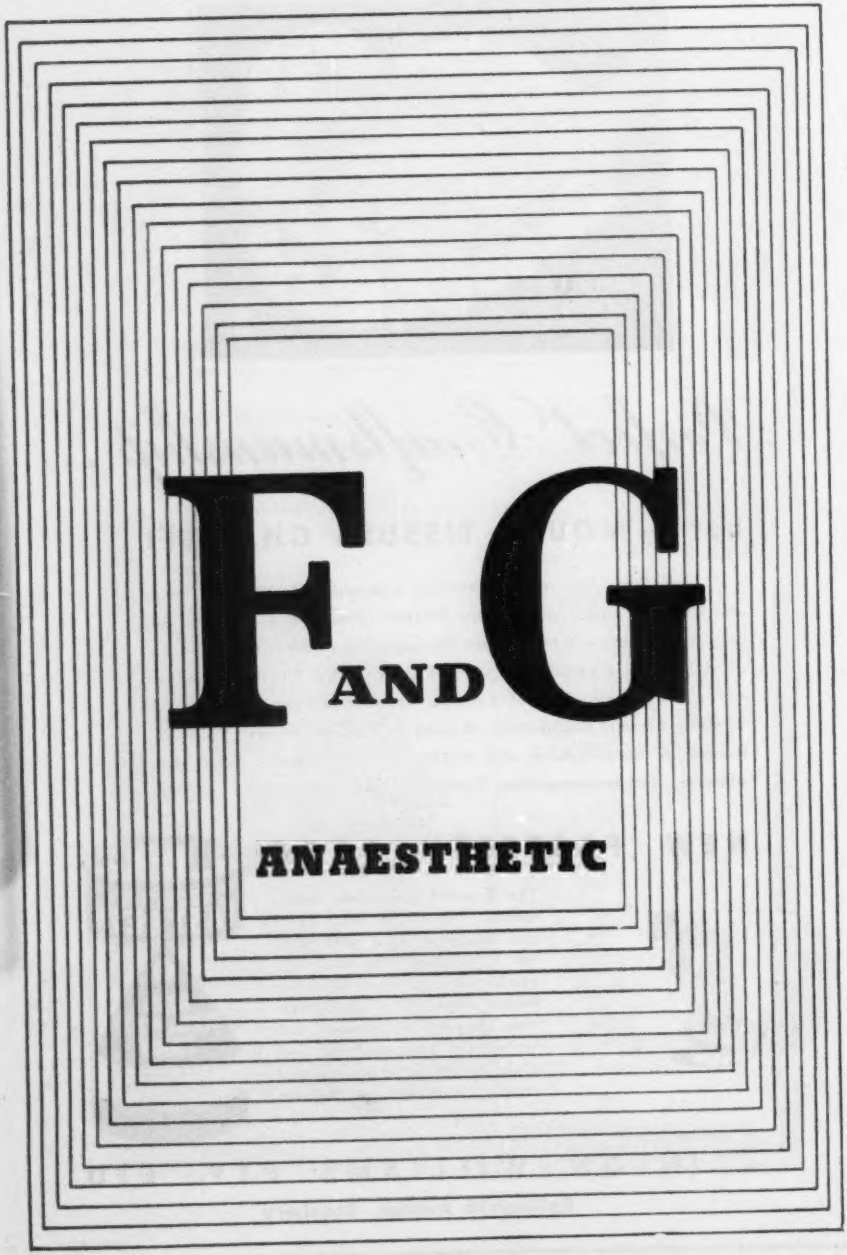

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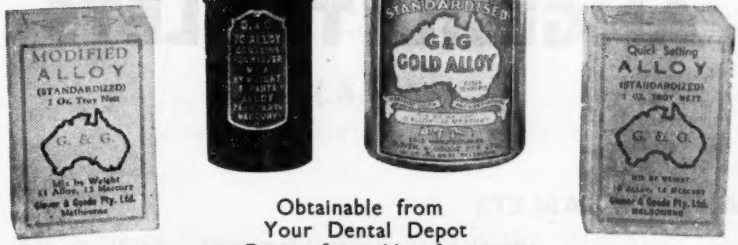

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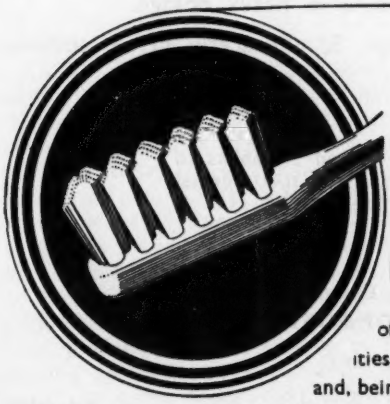

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The DENTAL Journal OF AUSTRALIA

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SPECIALIZED FRICTIONAL ATTACHMENTS AND THEIR ROLE IN PARTIAL DENTURE CONSTRUCTION*

WILFRID HALL TERRELL, D.D.S., F.A.C.D., PASADENA.

The use of precision attachments for partial denture retention is a practice builder for the better class of dentistry and helps to elevate the general standard of partial denture prosthetics. This work is not given with the idea of discrediting the usual type of partial denture work which, of necessity, must be used principally because of economic reasons but is presented with a feeling that it is the finest that can be given in partial denture construction. It may serve as an inspiration for a gradual improvement in the type of work that is done and knowledge of this work makes it possible to apply it in many cases where it could be used and in this way it gradually creates or builds a demand for this better type of service.

As Dr. Best knows, since he spent considerable time in my surgery before leaving for Australia, I do a great many of these cases. I have brought along slides of a few and I could have photographed a very large number to illustrate various combinations. You do not have to be a super dentist to do this type of work, but it does require extreme accuracy and should not be attempted by anyone who does not like detail. The average dentist in the United States does not do precision attachment work but there are many of the finer practices throughout the country that employ this technique and it is in demand by that class of patients who can afford it.

I am not going into the history and development of this but, like all other techniques, many men have added their contributions to its refinement. I think, probably, Herman Chayes, of New York, and B. B. McCollum, of Los Angeles, deserve the greatest credit in the development of precision attachments. An entire paper could be written on its history and development but, instead, I am going to give you details of the technique as we do it in our own office, as I am sure that some of you can make practical use of this and others of you may, as time goes on.

Before going into the technique, I will explain just what the difference is between these and other types of partials. The retention is obtained by means of specialized frictional attachments known as precision attachments, different ones being called by the name of the man who developed them. These

*Read at the Twelfth Australian Dental Congress.

attachments consist of two parts, a male and female part. Figure 4 shows the two parts of the precision attachments. The male part is that which is shaped like a "T" which is attached to the partial denture. The female portion is the boxing which is soldered into the abutment inlay or crown and it is into this that the male attachment fits. All attachments on a case must be absolutely parallel with the path of insertion of the partial denture and with each other. There are no clasps used as retainers and these internal attachments serve as frictional retainers and also as rests to carry the load in tooth-borne cases. On tissue-borne cases the McCollum distal extension attachment is used, which is shown in figure 4. The retention of this attachment is identical with the others but the saddle is attached in such a way as to be hinged to the male attachment instead of being soldered rigidly to it. This allows for tissue compression without putting a distal strain or pull on the abutment teeth. This same principle can be applied to clasps and later on in this paper I will give you a technique for the construction of clasps which have the identical action in eliminating the stress, which the distal extensions have in a precision attachment case.

Since there are no clasps and since the case is retained by internal attachments, it is evident that each abutment tooth must be prepared and have an inlay or a crown in which the attachment is placed. Very seldom is it necessary to prepare a perfectly good tooth in order to place an attachment for, usually, when a patient has lost a number of teeth and requires a partial, there will already be restorations in many of the other teeth. However, when you construct a fixed bridge you do not hesitate to make a preparation on the abutment tooth to carry that fixed bridge. For the same reason, when a case of this type is to be constructed, you should not hesitate to prepare these abutments any more than you would to prepare the abutments for a fixed bridge. A good restoration is not a detriment to a good tooth but actually serves as a protection to the surfaces which are covered. With present-day techniques it is possible to construct inlays and three-quarter crowns which fit so accurately that we need not worry about recurrent caries around the margins. There has been the criticism of this work that it requires deep preparations in order to allow for the attachments. This criticism shows lack of understanding and lack of practical application in practice. These cavities need not be cut any deeper than the average preparation in order to house the attachments. However, it does require skill in paralleling the preparations so that the attachments may be placed to the best advantage. You will always find criticism by those who do not understand the principle too well or who have not employed it successfully in their practices. The proof is in the practical cases and I invite any of you who can, to spend some time with me and see numbers of these cases that have been functioning for many years and with the greatest satisfaction.

I have heard some men state that they never construct a clasp case, but that they do 100 per cent. attachment work in their offices. I do not agree with them, for I think both clasps and attachments should be used and I feel we should apply them when and where they are indicated. That is like a periodontist saying that he treats all periodontia with surgery, or by electrocoagulation, or by instrumentation only. The intelligent man will employ all methods at his command and apply them where they should be used. We should keep our feet on the ground and not go overboard for one technique or

another to the exclusion of all else any more than a physician should apply the same remedy to every patient with the same disease, regardless of his general physical conditions and complications. I do hope some of you who have never attempted precision attachment cases will try them and I hope those of you who have made a few will find it easier to make many more of them. There is a great satisfaction both to yourself and to your patients in the completion of work that you feel is the finest that could be made.

Some of the advantages of precision attachment cases are as follow:—

1. Since attachments are parallel there is no strain on the abutment teeth in placing and removing the appliances.

2. There are no clasps under which caries, abrasion or erosion can develop.

3. Our abutment teeth help support each other as they are tied together by these parallel attachments.

4. Aesthetics is much improved because of the elimination of unsightly clasps.

5. They are more pleasant to wear as the design can be much more simple and places for food lodgment can be eliminated.

6. On distal extension cases the strain on the abutment teeth is relieved by the use of the distal extension attachment.

7. They are easily adjusted to any amount or degree of tightness with no danger of strain on the abutment teeth.

8. The partials are very easily kept clean because there are no exposed parts except the saddles and connectors.

9. Because of their advantages they appeal to the better class of patients and serve as a practice builder.

Since this work is not taught in the dental schools and since the demand for it is comparatively small, there are few opportunities for the practising dentist to learn details of construction. It is not difficult or complicated but does require painstaking accuracy. Few laboratories or technicians are trained to do this work but I have had several technicians during my time in practice whom I have taught and they have all become very adept at it. Some men have tried making their own attachments and I have seen some of the cases so made. I would not consider them very satisfactory. If you are going to do precision work it should be precision. The manufactured attachments are extremely accurate and surpass anything you can make in your own laboratory. They are well worth the price you pay for them. The actual cost of the complete attachment is less than you would charge your patient for a gold inlay and you could not afford to spend the time to try and duplicate these. The fees you get for these cases well cover the additional expense. The attachments are made from high-grade platinum alloy and will withstand a great deal of wear and will hold their adjustment.

The technique, as I first learned it, has been much improved and simplified and it is much easier to make one of these now than it was then. The use of the hydrocolloid technique for the impression of both the abutment teeth and the appliance has given us greater accuracy and more ease of construction.

Before starting the case, study models should always be made and a plan of construction laid out on the models. The outline of the partial should be drawn and the teeth to be used as abutments should be surveyed on a surveying instrument (Fig. 1.) to determine the path of insertion and the position

and form of the preparations which are to be made in the abutment teeth. The preparation of individual abutments with no thought given to the paralleling of the axial walls invites failure. All partial denture work should receive careful planning but it is impossible to do precision attachment work without first making a study of the case.

Fig. 1.—A Precision Surveying Instrument.

The next step is the preparation of the abutments. Operative as well as prosthetic dentistry has made valuable improvements in the last few years. The time required in cavity preparation has been greatly reduced and the accuracy with which we can make our castings is not to be compared with techniques used before the advent of the hydrocolloid technique. I do not use a rubber dam for the preparation of the cavities in the abutment teeth. The preparation can be done in much less time and with less shock to the tooth if it is done under water. At the present time I am using carbide burs and diamond stones almost exclusively and I can prepare cavities by this method in less time than it took me using the rubber dam and cutting the tooth dry with the ordinary dental burs. I use an attachment on the handpiece which throws a fine spray on the bur or diamond stone when it is cutting. This keeps it clean, makes it cut much faster and eliminates the danger of overheating the tooth. This same result can be obtained by having the assistant keep a constant spray on the bur or diamond as it is cutting. Definite box forms should be prepared in the abutment teeth and these should be parallel and a little wider than the attachments. The attachments come in various sizes and it is best to select the widest attachment which can be used in the space and still have some room for parelleling. All abutment teeth are prepared before any impressions are taken. M.O.D. or three-quarter crowns are the usual preparations that are used.

When our preparations are complete we are then ready to take our impressions. It is necessary that the gum tissue be clear of all gingival margins. For this purpose we use either 50 per cent. zinc chloride or the electric cautery. The electric cautery is not necessary unless there has been a previous restoration which goes below the gum line or unless there is caries extending

beneath the free gingiva. When the gingival margins have all been cleared, the cavities are dried and hydrocolloid is injected into all the cavities first, then a full maxillary or mandibular tray, which has been previously filled with hydrocolloid, is placed in the mouth and in one impression we secure an accurate impression of all the cavities in the abutment teeth, of all other teeth in the arch and the edentulous areas which are to be restored. A water-jacketed tray should be used and the hydrocolloid should be thoroughly chilled with ice water for at least five minutes. Removing an impression too soon is the usual cause of errors or remakes and there is no place for any inaccuracy in this technique. The individual abutment teeth are then poured in a very hard

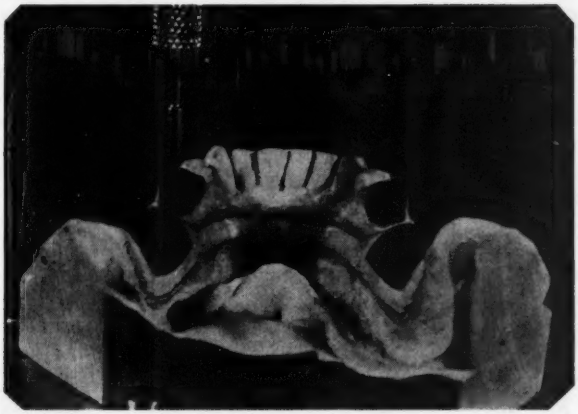


Fig. 2.—Surveying for Precision Attachments.

stone and a metal tapered pin placed in each while the stone is still soft. When these are thoroughly set they are removed, trimmed and placed in mineral oil to harden. The entire impression is then poured after these individual dies have been removed from the impression. The abutment teeth are not made removable in this cast for reasons of accuracy. After the impression is poured it is placed in water to set. When the stone has set the master cast is removed, the inlay dies are vaselined and placed in the impression and a second cast poured, which will give us a working cast with removable dies in which the inlays or crowns may be carved to contact and occlusion.

The box form for the attachments is carved in the wax-up of the abutments so that they are all parallel. This can best be done by placing the cast on a clasp surveyor and using the vertical arm of the instrument as a paralleling device. (Fig. 2.) Tilt the cast so the vertical is the path of insertion and then carve the box forms in the wax patterns of each abutment parallel to this and they will all be parallel to each other. We use the vertical arm of our clasp surveyor as our parallelometer and have a chuck attached to it which holds the mandrel on which we place the female attachment when paralleling the carvings in the wax. The boxings in the wax patterns are carved to accommodate the attachments. Thus, when all the abutment castings have been made and assembled on the master cast, we will find that the attachments can

easily be paralleled and all abutment castings will be properly contoured to house the attachments. I think you can see why it would be impossible to construct individual inlays or crowns and expect to be able to place attachments in these that would all be parallel.

The next step is to parallel and solder the female attachments in each of the abutment castings. This is not difficult as they are sticky-waxed into place, and then the inlays with the attachments are removed from the cast and they are imbedded in soldering investment. Thin, flat carbons are provided which fit loosely in the female attachments. Soft investment is worked into the attachment with this carbon point. The investment is then placed around the extending portion of the carbon and around the inlay or crown leaving the front open for placing the solder. When set, the wax is removed with hot water

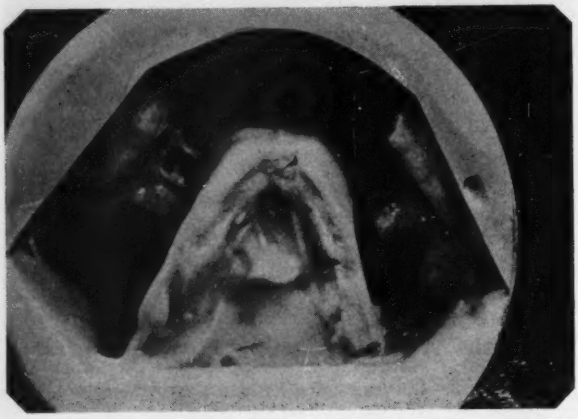


Fig. 3.—Model Duplication.

and the investment is thoroughly dried in the oven. The carbon point which was placed in the attachment and in the investment holds the attachment in its proper relationship to the inlay while solder is drawn around it. Always be sure to paint all parts where solder is not to flow with a solution of chloroform and rouge. It is well to solder one attachment first and replace it on the master cast, check it with the mandrel and then parallel the others to this first one which has been soldered. The paralleling of the attachments should be done on the master cast and not on the cast on which the inlays were carved, as removable dies may produce a slight error which would not happen on the rigid cast.

When all attachments have been soldered and placed on the cast and checked, we are then ready to prepare for making our duplicate model in investment on which will be cast the partial denture. All undercuts around the abutment teeth are eliminated with undercut wax. The inlays and crowns are removed from the abutment teeth before the cast is duplicated. With a small hydrocolloid syringe the preparations are filled with hydrocolloid before the hydrocolloid is poured over the master cast. This is done in a duplicating flask (Fig. 3.) and thoroughly chilled. The cast is removed from the hydro-

colloid. The mould is poured in model investment. If it is to be an upper partial, we always scrape the master cast along the palatal border of the partial outline before duplicating so that this edge of the partial will fit tightly

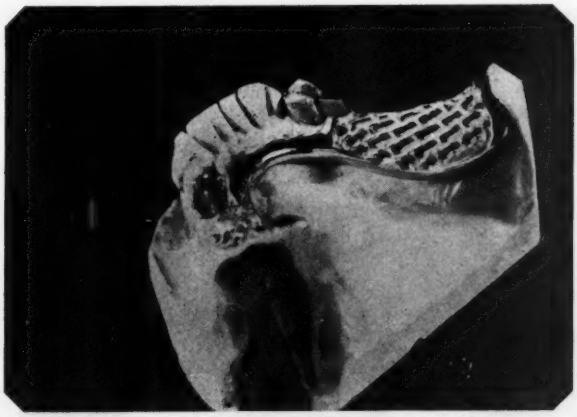


Fig. 4.—Distal Extension Attachment in place.

against the tissues, preventing food from getting under, and the patient's tongue from feeling the edge. When the investment cast has been thoroughly dried it is boiled in beeswax in order to harden it and prevent it from flaking

Fig. 5.—Distal Extension Attachments in place with wax teeth carved.

off while working. There is also a cast spray which works very well for this purpose.

We used to make these casts entirely with gold bases and tube teeth. However, since the advent of acrylic we are now making them with the frame-

work of gold and the saddles are made of acrylic for aesthetic reasons and also so they can be rebased when necessary.

At the next appointment we fit our abutment castings, adjust the occlusion and contacts and polish.

The inlays and crowns with the male attachments placed in them are now put on their respective abutments on the investment cast. (Fig. 4.) A forked truss is waxed around the extension of the male attachment to which it will be soldered later. When the casting is made it is placed back on the master cast as are the abutment castings with the complete attachments in them. A plaster core is made relating each of the male attachments to the partial denture. These are removed and, after anti-fluxing where necessary with

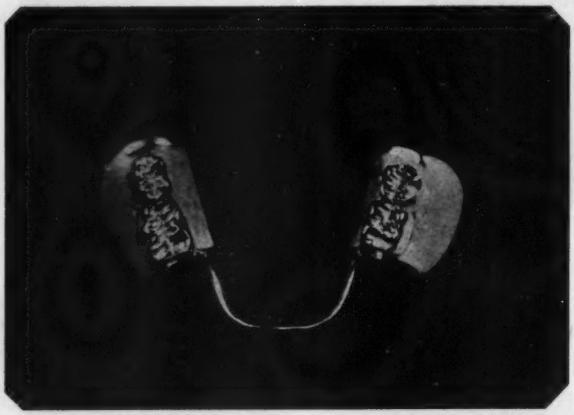


Fig. 6.—Close-bite case with all gold occlusals.

chloroform and rouge, are invested and the male attachments soldered to the partial. If a distal extension attachment is used we cast a gold tooth around the distal extension, having previously soldered a tube to the side of the housing and drilled and tapped it for the screw. (Fig. 5.) After this has been cast it is assembled on the master cast, a plaster core is taken and it is invested and soldered to the partial. It is possible in some cases to use plastic teeth in this position, but we usually prefer to cast them in gold with porcelain or plastic facings.

Wax bite blocks are built on the framework and at the next appointment we check the framework and the parallelism of the attachments in the mouth. If there should be any discrepancies in the parallelism or if any error has crept in, it will show up at this time and can be corrected before the case is completed. Check-bites are taken with a centre bearing device and plaster if it is a bilateral distal extension or in wax if it is tooth-borne.

The casts are then mounted on the articulator and the teeth set up. If we are making a partial only in one arch, then we take an alginate impression of the opposing arch and pour a cast in low fusing metal. We articulate our teeth against this metal cast. When the teeth have been set up, we have an appointment with the patient for a final check and the case is then cured and finished for delivery. (Fig. 6.)

Ample time should be reserved at the time of cementation and we usually never allow less than two hours for this appointment. However, we do not make a practice of cementing the abutments on the first day. There should be sufficient frictional retention of the abutment castings to hold the case in place and we have the patient wear it for at least twenty-four hours before cementation. They are instructed not to remove it themselves. This gives the attachments a chance to loosen up slightly and for all parts of the cast to settle into position. (Fig. 7.) On the day of cementation we take plenty of time to seat each abutment individually. We thoroughly sterilize the cavities

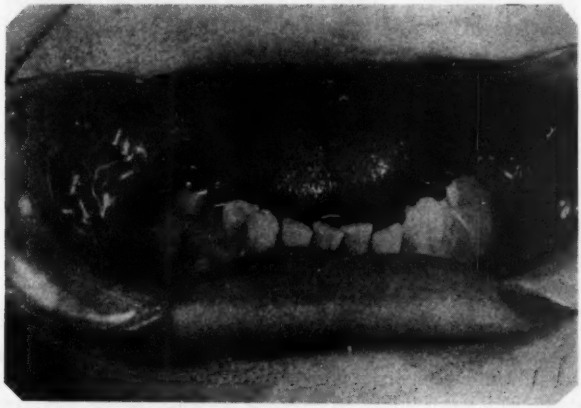


Fig. 7.—A Complete Mouth Reconstruction using Distal Extension Attachments.

with thymol and follow this with chloroform to remove any of the essential oils. Alcohol is a dehydrant and is unnecessarily painful. The cavity is then coated with Copelite, a thin cavity varnish which penetrates the surface of the dentine and prevents irritation by the cement. Before cementation we always remove a very thin layer of gold on the axial wall of the restoration and then serate this surface so that the cement has a mechanical retention. The patient is again instructed not to remove the partial until the next day, at which time it is adjusted and the patient is given instructions as to its removal and care. It is well to have him back again the next day for a check-up to see that everything is functioning properly and that he is having no difficulties. (Figs. 8 and 9.)

There is another type of attachment, called a Dowel Rest Attachment, which does not require the purchase of any manufactured parts. This was developed by Thompson, and there is another called the Spring Lock Attachment, which was developed by Neurohr. You may be familiar with these. They both require the preparation of abutment teeth for inlays or crowns. The Dowel Rest has a small clasp on the lingual which has a ball-point cast to fit in a depression on the lingual of a crown. This serves as a retainer, preventing the attachment from coming out of the abutment. The stress is borne by a dowel which is attached to the partial and fits into a countersunk groove on the distal of the crown. The Spring Lock is similar but it is retained

in place by a spring wire which snaps into a notch in the abutment casting. This must be released before the attachment can be removed. Neither of these have the refinement of the precision attachment but do have some of the

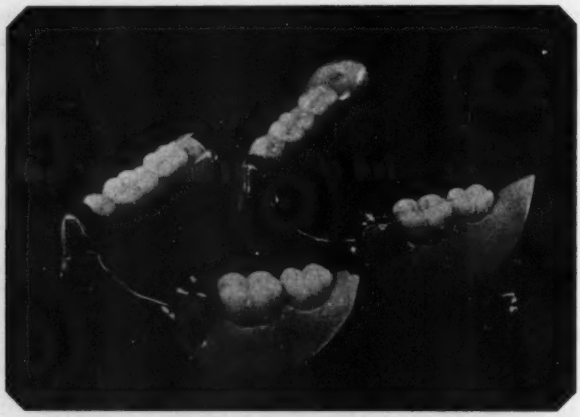


Fig. 8.—Duplicate Precision Attachment Partials.

advantages over clasps. They do break the stress on the abutment in distal extensions and do not rest on tooth structure and there is no display of gold as with clasps. If I were going to prepare a tooth for an abutment casting I

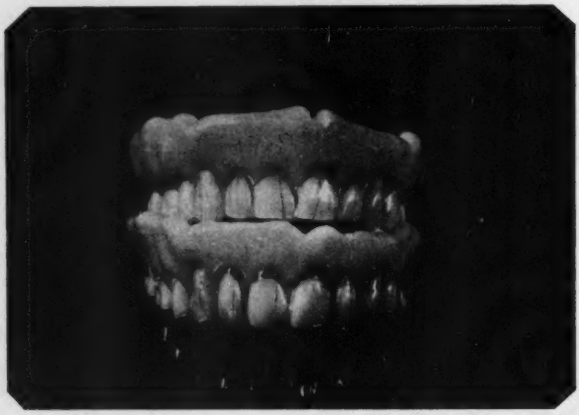


Fig. 9.—Duplicate Upper Dentures made interchangeable with either Precision Attachment Lower Partial.

would rather go all the way and make a precision attachment case than to use one of the other substitute types which is only a compromise in refinement. However, in cases where it is important that gold not be shown and retention

be secured, some men prefer to use these and save the cost and work of precision attachments.

Last of all, I would like to give you a stress-breaker which we have developed for use with clasps and which we are now using in the office in all distal extension cases retained by clasps. As I said in the beginning, I do not make precision attachment cases for all my patients and I do feel there is a big place for clasps in partial denture work. One of the greatest causes of loss of abutment teeth in partial dentures has been the clasping rigidly of a long distal extension saddle to an abutment tooth. We have all seen these teeth loosened and lost as a result. However, the use of a stress-breaker, which I am going to describe, makes it possible to have the same effect as you would have with a distal extension precision attachment.

Fig. 10.—The Distal Extension Clasp to which the Saddle is hinged.

Before impressions are taken for any clasp case, be sure that adequate preparation has been made for the occlusal rests. A clasp will not hold its position properly without an occlusal rest and the rest also transmits some vertical force to the tooth and makes the partial more efficient and comfortable. Impressions for these cases may be taken either with hydrocolloid or the alginates. The cast is poured in hard stone and surveyed on a clasp surveyor. All undercuts on the abutment teeth are blocked out with undercut wax. The path of insertion is outlined and the height of contour on the abutment teeth marked, first with a clasp surveyor and then with an indelible pencil. The cast is then duplicated in investment material, the duplicating flask is kept wet while the investment is setting and a second duplicate cast is poured in the mould. The first cast is the one upon which the partial casting will be made and the second cast is the one on which we wax up and cast our clasps. The clasps are waxed according to the survey lines. In place of the usual truss arm, which extends from the body of the clasp to the saddle, we use a piece of pink base-plate wax set edgewise to form this truss and, at the bottom, as close to the tooth and as close to the ridge as possible, a hole is made in the wax through which will pass a screw that will hold the clasp to the partial and

form the hinge which provides the broken stress between the saddle and the clasp. I think this can be more easily seen from figure 10. The clasps to which broken stress is to be applied are cast first. When the individual clasps have been cast they are polished and fitted to the master cast and then

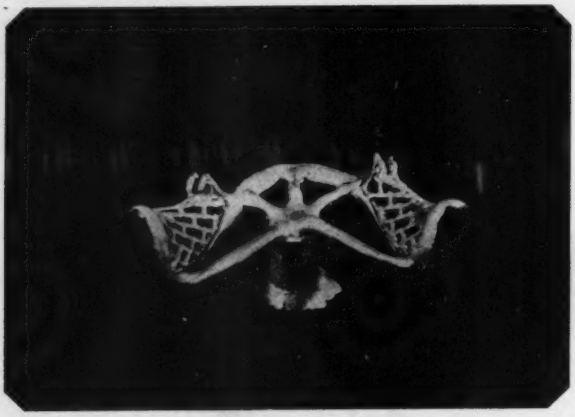


Fig. 11.—Casting for a Stress-breaker Case.

placed on the investment cast. The framework for the partial, including all other clasps, is then waxed up. On the broken-stress clasps we wax a thin flange on either side of the truss extending down from the clasp. It is left

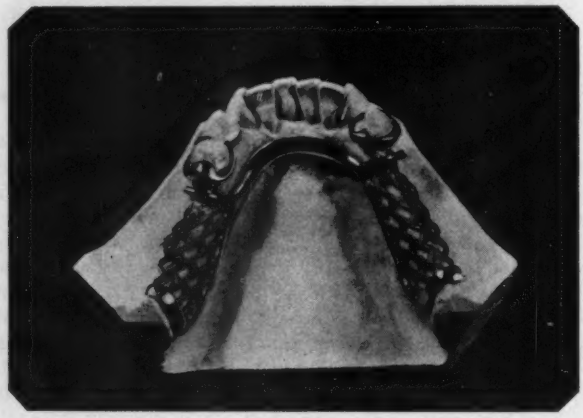


Fig. 12.—Finished casting for Broken-stress Partial.

open on top and underneath and is so formed that the saddle can move down at the distal but cannot rise. A hole is made through the wax to correspond with the hole in the truss. The cast clasps are then removed and the case is invested and cast. (Fig. 11.) After that it is cleaned up and fitted to the master

cast and fitted also to the clasps. The holes are then enlarged to the size of the screw which we use. The screw is placed in the lingual and is threaded only into the lingual plate in which the vertical truss fits. That portion of the screw which passes through the vertical support of the clasp is not threaded and is a snug fit. When this screw is in place the clasp is free to move forward and backward but when the case is cured it can only move forward and not backward. This results in allowing the distal of the saddle to move downward under pressure but not lift. The truss arm of the clasp fits rigidly in its slot and cannot move sideways, thus giving the abutment tooth lateral support from the other clasped teeth. This stress-breaker is very easy to construct. It takes the minimum amount of space and will allow for tooth replacement directly against the clasped tooth even in very short bite cases. It functions

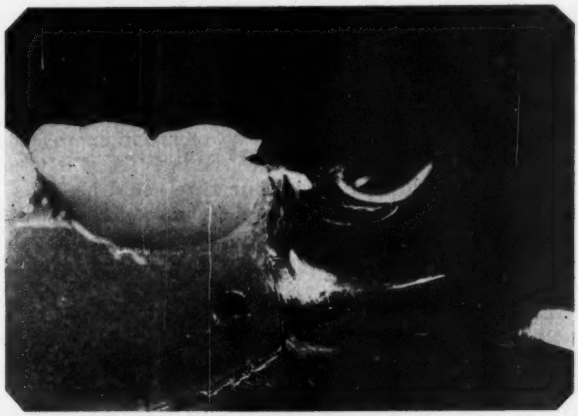


Fig. 13.—Close-up of Distal Extension Clasp.

exactly as a distal extension attachment on a precision attachment case. (Fig. 12.) It relieves the stress on the abutment tooth where we do not wish to cut into these abutment teeth and gives our patient the most permanent type of restoration that we know of. There are many who disagree with broken-stress, as you will notice from Dr. Steffel's paper. We have all seen much damage done where stress-breakers were not used where indicated, and we have also seen damage done by the use of the wrong types. However, I have not seen damage done by distal extension precision attachments, nor have I seen any harm occurring as a result of the use of this new stress-breaker. I am sure that the life of abutment teeth when freed from a distal pull is going to be much longer than it would be if those saddles were attached rigidly to a clasp, which would either spring up and down on the tooth or pull the tooth with the saddle. (Fig. 13.)

I hope these explanations have not seemed too complicated and that they have been self-explanatory, and I am sure after using some of these you will find much satisfaction in their continued use. If we give our patients the best that we know at all times and continue to improve and progress as we have the opportunity, it will pay dividends both in satisfaction from our work and from the type of practice we build. If we will do our work better than average, even if it costs more to do it both in time and overhead, it will pay dividends in the long run.

A PRECISION TECHNIQUE PRODUCING DENTURES THAT FIT AND FUNCTION*

WILFRID HALL TERRELL, D.D.S., F.A.C.D., PASADENA.

This paper is not an analysis of various methods of denture construction, but is a presentation of a particular technique given in as much detail as time will allow. Though you have your own method of construction, it is always interesting to see how someone else does it and I hope there may be a few points given which you can at least add to your own procedures to an advantage. There are many good techniques.

There has been a gradual progress in the development of materials and instruments available for denture construction and also an increased understanding of the important factors necessary for consistent results. Exchange of ideas such as we have at this meeting does much to stimulate progress. The dentures we make today should be better than those we made even five years ago. Let us see to it that progress never stops and never allow ourselves to reach that point where we feel there is no room for improvement and that we can learn nothing more. When this becomes the case it is time wasted for us to attend meetings such as this and our time could be spent much more profitably in other ways. However, science, medicine and dentistry are progressing rapidly and will always continue to do so.

It is important that we all have some definite procedure for denture construction which we know will produce results that are excellent and do it consistently. Short cuts in construction are usually very expensive for too much time will be used later in adjustments. The ideal denture is one which fits the patient comfortably with a maximum of retention. It should have perfect balance, with teeth that are sharp enough to cut food. There should be co-ordination of function with aesthetics, with sufficient study given to each case to produce a natural effect that is not detectable as being artificial. The accuracy of our work will show up in the limited number of adjustments which will be required.

FIRST APPOINTMENT.

Examination.

This appointment is a most important one, for it is at this time that we decide whether or not we want the patient and the patient is deciding whether or not we are to be his or her prosthodontist. First, a thorough examination of the mouth is made to determine the favourable and unfavourable factors of the case. These should be noted and brought to the patient's attention. This should be followed by a consultation with the patient in order to ascertain a complete case history. From this we will learn much. We will learn why previous work has not been satisfactory and whether it was the dentist's fault, the patient's fault, or the fault of the mouth. We should be studying our patients during this consultation and decide whether or not we want them. It is much easier to get undesirable patients than it is to get rid of them. To be a successful prosthodontist we must choose our

*Read at the Twelfth Australian Dental Congress.

patients and take only those we are convinced we can satisfy. This does not mean to take only the easy ones. Many of my happiest patients are difficult cases which other dentists have referred to me. I enjoy hard cases and there is a satisfaction that is much greater than average in satisfying these. However, all patients must be analysed. Some are seeking the impossible and they are doomed to disappointment if they cannot be educated to their limitation. Prosthodontists are not miracle men. It is well to list on the patients' charts the favourable and unfavourable factors. These should be discussed with the patients. Promise only those things which we know we can deliver. We should call to the patients' attention the difficulties of their cases and impress upon them their limitations.

After this discussion and examination we should decide upon the fee we will require to do the work. This necessarily must vary with all cases and no fees can be set which will be fair to us or the patients until this appointment has been completed. If we accept the neurotic type we should make them pay for the grief they will give us. I could write a paper on this subject alone, for I have learned much as, no doubt, all of you have. The secret of success in prosthetics, aside from the ability of the operator, is a thorough analysis of patients.

SECOND APPOINTMENT.

Primary Impression.

The subject of impressions requires more detailed discussion than some other parts of the technique though it is only one link in the chain and no more important to success than any others.

There is considerable confusion in the minds of many dentists as to what is the best impression procedure—so-called muco-static methods or methods involving compression of tissue. There have always been two schools of thought: one believing in compression, if this is possible, and the other in making impressions with the tissues at rest. Muco-statics is not new for there have been many impression methods used by our preceptors which involved this same principle of making impressions of the tissues in a static or at-rest condition. I cannot agree, however, with the followers of the muco-static technique, that peripheral borders should be arbitrary in extension and knife-edge in thickness. Neither do I agree that metal bases are always indicated. I make both acrylic and metal bases and I think they all have their place. There is no remedy that will cure all ills, and metal bases are not always desirable. Neither is one particular metal, only, the answer where metal is indicated. Furthermore, muco-statics is not a guarantee of a successful denture. Many other factors must enter in. I do agree with the muco-static principle of making an impression providing it covers all the available stress-bearing area and has a peripheral border which has been formed by the tissues.

Several years ago we found that in the cases we rebased we had practically no adjustments to make, the dentures were more comfortable, the retention was better and seemingly more permanent. We were taking these impressions with the tissues at rest, and there was no attempted compression which would give us distortion or displacement. Now, all our impressions are taken in this manner and the results speak for themselves. We do not even

use modelling compound with which to mould the borders unless the tray is short at some point and needs to be extended.

The primary impressions can be made with various materials and trays. The material selected should be quite soft so as not to distort the tissues but should have enough resistance to carry it slightly beyond the denture base area and get a good impression of all the peripheral areas. We should use a material that we can handle well and only one insertion of the tray should be required. It is important that the proper tray be selected as to size and shape before this impression is made. Throughout this technique I will give you a choice of materials and equipment as it is more important how you use them than what you use. I will mention those things which I use but this does not mean that you cannot use others and get good results. The physical properties of the materials should be similar.

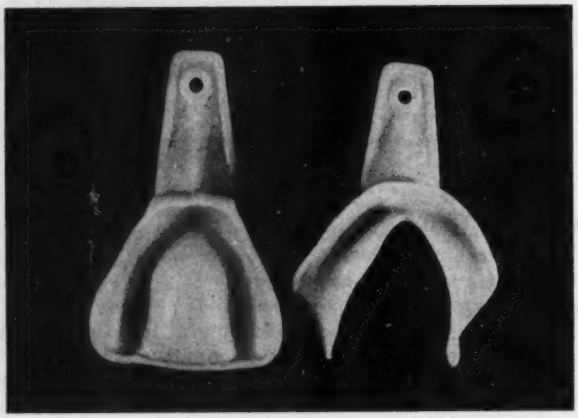


Fig. 1.—Primary Trays made of Plastic.

The materials that can be used for primary impressions, given in the order of preference, are: (1) Muco-Seal, (2) Alginates, (3) Hydrocolloid, and (4) Impression Compound. Our primary impressions are taken with Muco-Seal in plastic trays which we made in the laboratory. (Fig. 1.) They are anatomical trays which cover the lateral throat form, the retro-molar pad and curve outward and up to get the external oblique ridges without cutting through the impression material. Alginates or hydrocolloid may be used in these trays as they have rim-lock borders for retaining the impression material. You can make these trays yourself by reshaping and adding wax to standard S.S. White Aluminium trays to be used as patterns. It is important to have a tray that will carry the material to the desired areas.

Muco-Seal is an acrylic resin which comes as a powder and liquid. When mixed it is used in a very mouldable or plastic form. It does not compress tissues but it does get a beautiful impression of all denture base areas, and will spring out of the undercuts. (Figs. 2 and 3.) The detail is picked up in the final impression. Alginates or hydrocolloids may also be used. It is necessary

to be careful that they flow up around the tuberosities and that they do not trap air in vital spots along the borders. Compound, though least desirable, may be used if undercuts are not severe and it is not used too stiffly. Good primary impressions are just as important to the final results as good final impressions.

Fig. 2.—Primary Upper Impression.

Fig. 3.—Primary Lower Impression.

At this same appointment the moulds and shades of teeth are selected. The plan for natural effects is made by mixing shades and moulds, if desirable, and deciding upon a characteristic set-up for the type of individual. The advisability of art work to be done on the porcelain teeth with stains and glazes should be studied and outlined. All of these may be varied as the case

progresses, for aesthetics is a very important part of denture work and one that is often neglected.

OUTLINING BASES ON CASTS.

The upper is outlined just to the point where the check begins to reflect. If over-extended the final impression will be cut through to the tray in places along the border, and this will have to be corrected before the final impression is made.

Fig. 4.—Lateral inside view of typical lower denture made by Terrell Precision Technique.

The lower must be very carefully outlined so as not to be over-extended on the border and yet to cover all areas necessary for retention. The best final impression cannot be made by this method if the base is not correct. Beginning at the disto-buccal extremity we follow forward on the external oblique ridge. This fades into the lateral surface of the mandible in the bicuspid region. The outline must follow close to the vertical surface of the mandible following, as on the upper, the point where the reflection outward begins, being sure to clear the attachment of the buccal and labial frenums. On the lingual, beginning at the distal, the outline crosses the distal of the retro-molar pad and extends around in the arc of a small circle to the point where this intersects the distal end of the mylohyoid ridge. (Fig. 4.) There is no attempt made to utilise all the apparent area available here. The outline then extends down the mylohyoid ridge, for a distance of not more than 2mm. This is the rule, but the exception will allow in some cases for the extension to go to the floor of the mouth. These cases are those where there are no undercuts beneath the mylohyoid ridges and the mouth is shallow. The primary impression from which the lower cast was made gave us an impression of the floor of the mouth at rest, covering that area which extends from the lowest point, which is in the bicuspid regions, forward to the lingual frenum at the midline. This space is utilised for retention, adding much to the comfort and utility of the lower

denture. The lower denture should be made thicker in this area. (Fig. 5.) A great deal of care must be taken with the impressions and the outlining of the cases or all value will be lost. There are two places to watch closely: one is the two papillae forming the opening for the sublingual glands, the other is the lingual frenum. These are the only places that are apt to develop soreness and this can be very severe if not observed in time. All outlines on upper and lower casts are scratched with a sharp instrument so the technician can see where to trim the borders of the acrylic bases.

Fig. 5.—Lingual view of typical lower denture.

ACRYLIC BASES.

The acrylic bases not only serve as our impression trays but also are used for obtaining: (1) Vertical opening. (2) Approximate centric. (3) Check bites to obtain the maxillo-mandibular relationship. (4) Bases on which to set up the teeth for try-in. They are waxed-up on the casts with a full thickness of base-plate wax and then reinforced around the border and across the distal and slightly to the lingual of the ridges. (Fig. 6.) They should be rigid when completed. They are made of denture acrylic and cured in the same manner only it is not necessary to give them a long, slow cure as there is no bulk of material and they are only for temporary use. They may also be made of the self-curing tray acrylic in about thirty minutes. After curing, the bases should be trimmed to the bead which has resulted from scratching the cast along the line which was drawn to determine the border outline. Wax rims are added and they are then ready for the next appointment.

THIRD APPOINTMENT.

Vertical Opening and Final Impressions.

Vertical opening is not determined by any rule but by judgment of the operator. There is much said nowadays about freeway space and the rest position of the mandible. The space between the wax rims, when the patient is speaking, should be approximately 2 millimeters. It is well to observe the

patient during speech and, if the wax rims should contact on certain words, they should be reduced in height. If the space should be more than 2 millimeters the rims should be lengthened. Have the patient count from one to ten, first slowly and then rapidly, and observe the space between the wax rims.

Fig. 6.—Wax-up for Plastic Impression Base.

The aesthetics of the case when the patient has the rims in contact is an aid but it should be remembered that there should be this freeway space allowed when the mouth is in repose. To build the wax rims so they contact at the

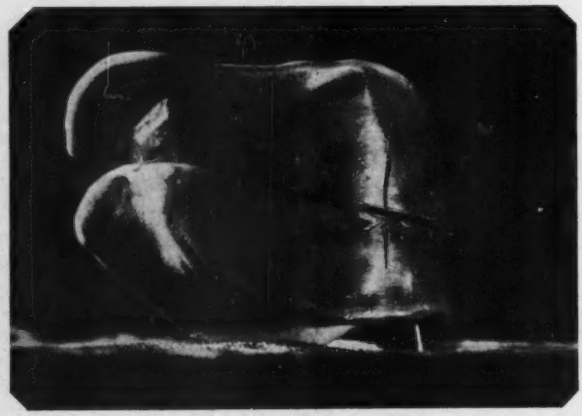


Fig. 7.—Wax Bite-blocks for obtaining Vertical Opening and Approximate Centric.

desired aesthetic vertical opening would be giving the patient too great a vertical opening. (Fig. 7.) The length of the teeth for aesthetics can be varied by the overjet and the overbite but correct vertical opening has to do with comfort when the mouth is in repose, during speech, and when the dentures are

in function. If the dentures are firmly in place, the teeth should never contact at any time during speech. Some attempts have been made to determine vertical opening by finding that point at which the patient can produce the greatest amount of biting pressure. There are other methods which attempt to establish the opening by dividing the face into thirds, establishing the lower third of the face equal to each of the other thirds. This, in some cases, will work but in many patients these proportions would not be correct. From an aesthetic standpoint we cannot make our patients all fit a rule. I do believe that by establishing a freeway space between the wax rims and observing the patient for a considerable time during speech that we can come very close to determining a vertical opening which will not only be comfortable but also incorporate the aesthetic requirements. The wax rims are reduced by means of a **curved hotplate** (Fig. 8.) until they contact at the desired height. This vertical opening, which has been carefully established, will be carried through to the finished case by means of the articulator used. It must have an incisal pin or a definite vertical stop in order to preserve this opening.

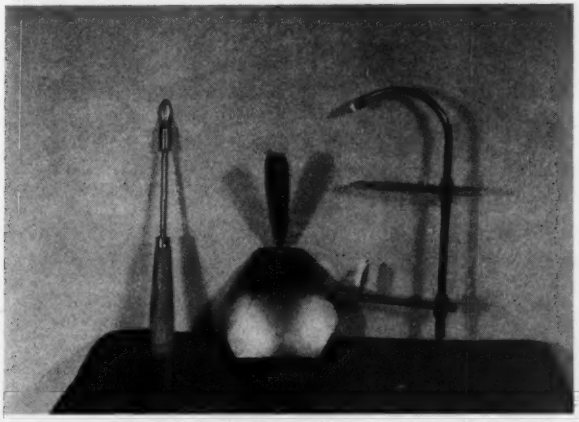


Fig. 8.—Instruments used for obtaining Vertical Opening. Curved Hot Plate and Wax Pooling Instrument designed by Dr. M. M. House. Sorenson Bite-gauge used for Comparative measurements in obtaining Vertical Opening.

The method used to obtain centric closure is to tilt the chair horizontally with the head well back. First, the patient is instructed to move the mandible forward and backward until a slight thud is felt or heard as the condyles hit the back of the glenoid fossae. This is practised with the wax rims slightly separated as the mandible is moved forward and backward.

After notching the upper rim and pooling the lower wax rim with a **hot-pooling instrument,** the bases are placed in the patient's mouth and the mandible moved forward and backward as before. By pressing very lightly on the tip of the chin you can feel the condyles reach the back of the glenoid fossae. Stop the patient at this point, instructing him to roll the tongue as far back in the roof of the mouth as possible and gently close. The soft wax in the centre of the lower rim will key itself to the notches in the upper (Fig. 9.) but do

not let the patient decrease the vertical opening by applying pressure to the rims. When cooled, have the patient close with a slight tapping motion and it will be noted that closure is always at the same point. At this time it is well to mark the median line on the wax rims before they are removed.

Fig. 9.—Wax Rims Keyed together in Approximate Centric.

THE UPPER IMPRESSION.

The upper impression is made by painting the tissue surface of the impression base with the material selected for the impression. There are

Fig. 10.—Heater for Impression Gel.

several materials which could be used as long as they have the essential physical properties. We become familiar with the use of certain materials and when we change to another it is often difficult to get a good result until we

have had considerable practice with it. The material which we select for this purpose should be one which will flow readily in the mouth, one which will not distort or displace tissues, and one which will accurately copy the surface detail of the tissues. Selection of the material should be determined by the accuracy with which it reproduces the surface anatomy of the tissues combined with the ease with which it can be used by the operator. Most of the zinc oxide impression pastes will serve this purpose very well though they are somewhat difficult to use. The material I am using at present is one which flows very readily. It is called Indicator Gel. (Fig. 10.) It softens when heated and when it is chilled becomes quite firm. It will not stick or adhere to the tissues and can be easily removed from the base if the first insertion is not satisfactory. It is also possible to surface heat it with a spot-heating torch or add to it. We use it not only for the final impressions but also for relining and rebasing and

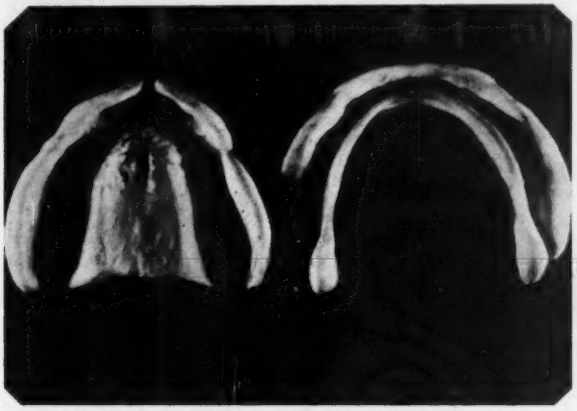


Fig. 11.—Final Upper and Lower Impressions.

for locating pressure spots under dentures. It is not foolproof and requires some skill in its use but results will justify the care necessary to get good results.

This material is brushed on the inside of the acrylic impression base; a spot-heating torch or a jet of steam is then used to smooth the surface and eliminate the bubbles. The impression is guided lightly to place and the patient is instructed to open the mouth wide while the impression is steadied by the operator. All the muscle-trimming that is done around the upper is just a gentle inward and downward pressure against the tissues of the cheeks and lips so that the borders are not thickened and the border tissues are not displaced. It is then chilled before removal. (Fig. 11.) It is easy to correct any point where you have failed to obtain a good impression by heating it and then adding a little of the impression material. This is again heated and placed in the mouth.

We have added a third step to our impression technique which completely eliminates the old trial and error method of building peripheral borders which has been used for so many years. With compound, no two impressions of the

same mouth would be identical on the peripheral borders, but by this method of obtaining the peripheral border, a number of impressions of the same mouth will be the same. The final impression of the peripheral border is obtained by the use of Truplastic, soluble plaster or impression plaster. For the best retention of upper dentures we must have perfect tissue adaptation. In addition to this we must have an accurate peripheral border and a good seal across the posterior. This sounds obvious, but a careful analysis of dentures with which patients are reporting difficulty with retention will show that it is a failure in one of these three points. To have maximum retention, the peripheral border should include all of the space in the buccal and labial reflections from tuberosity around to tuberosity but not be thick enough to interfere with muscle function. Dentures which require very little adjustment do not

Fig. 12.—Skull showing Hamular Notch.

just happen but are the result of a careful, accurate impression technique, coupled with a balanced occlusion.

The chair is now tilted horizontally, with the head well back, and the impression is made of the periphery by applying a very small amount of the special impression plaster around the peripheral border by means of a cement spatula. Place wet cotton rolls between the wax rims and have the patient close firmly. The cheek is held out and the Truplastic is placed high up in the buccal fold around the tuberosity area coming forward to the cuspid area, across the anterior and back to the tuberosity area on the opposite side. The chair is next placed in an upright position. The patient is instructed to bring the lips together firmly, moving them forward and backward. Have the patient relax and we mould the thickness of the peripheral border by gently pressing inward and downward. The border should be so perfectly moulded that it will not be necessary to trim the finished denture. The post-damming is not done on the impression but always on the cast. If the impression of these tissues has been taken with them at rest we can apply our seal across the posterior border by grooving the cast the desired depth and we can control exactly the pressure to be applied. In order to have a good post-dam it is not necessary to compress this tissue to a maximum as is often done by the post-damming techniques employing modelling compound. After the upper denture impression is completed, we mark the hamular notches (Fig. 12.) with an indelible pencil and connect these with a line which usually passes through the palatal

foveae. We observe, by having the patient say "Ah!" and thus flexing the soft palate, just where the post-dam should be placed. The compressibility of this tissue is then tested. The post-dam should always be placed on the immovable, compressible soft palate but should not extend distally on to the flexible

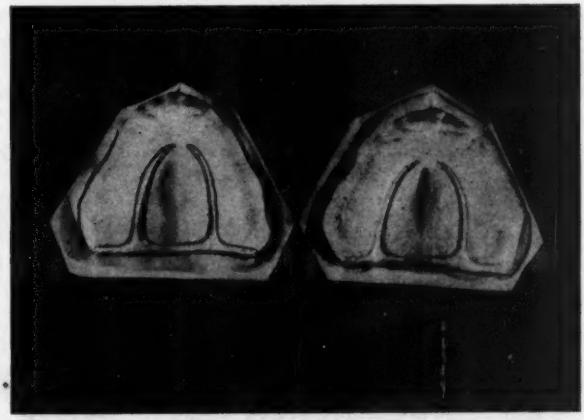


Fig. 13.—Upper Casts showing Post Dam and Palatal Seal.

soft palate. A post-dam accurately placed and carefully done should never require adjustments. Besides the post-dam we have added an additional seal which we term a palatal seal. (Fig. 13.) This has been used for several years now, giving considerable additional retention to the upper denture and with

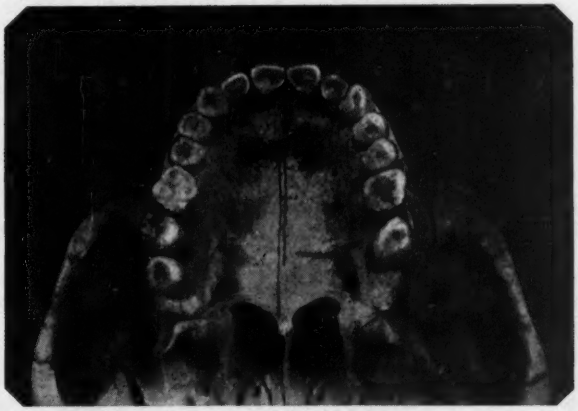


Fig. 14.—Palatal View of Skull.

no detrimental effects. It extends forward, on either side from the posterior palatine area, in that soft tissue between the hard palate and the base of the ridge. (Fig. 14.) This tissue should be palpated with a large ball burnisher

and a line drawn with an indelible pencil along the area of greatest compressibility, stopping when it reaches the non-compressible tissue in the rugae area. This will add much to the retention of the upper denture. After having marked the post-dam and palatal seal we replace the upper impression, getting a transfer of the lines on the impression. With a sharp, pointed instrument we scratch a line along the mark so that it will be transferred to the final cast that we may know exactly where these seals are to be placed. The depth of the seal which is placed on the cast with a No. 8 round bur should be between a quarter and a half the diameter of the bur. If it should be too deep it could

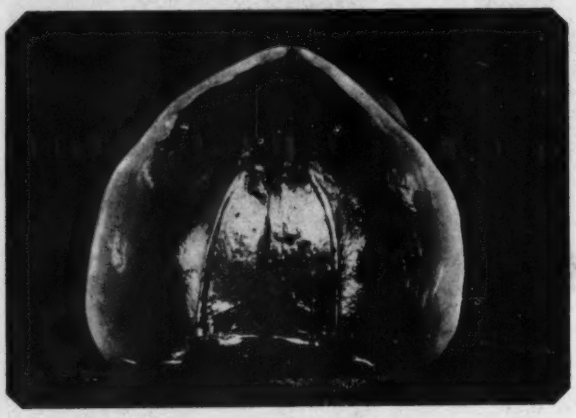


Fig. 15.—Palatal view of Gold Palate Upper.

be polished off in the finished denture, but a little practise will show you the amount the average mouth will require. If done properly there will be no soreness on the post-dam or the palatal seal and the retention will be greater than any you have ever known without the addition of this step. (Fig. 15.) Retention obtained in this way will remain much more permanent than retention obtained by increasing the pressure around the peripheral border. Soft, flexible tissues do not change by the addition of slight pressure but hard tissues will soon resorb and cause a loss of retention. Remember to place the seals in the correct places by transferring these lines from the mouth to the impression and not arbitrarily placing them on the cast with no guide to follow.

THE LOWER IMPRESSION.

The technique for the lower impression is exactly the same as for the upper. The inside of the impression base is coated with a thin coating of the impression material. It is seated in the mouth without pressure and held by the operator with the mouth open wide while the material sets or chills. Upon removal, if the impression is satisfactory, we are then ready to apply the peripheral border in the same manner we did in the upper impression. If there are any places that need correction this should be done first. The difference between the lower impression and the upper is that the tongue is on the

lingual border of the lower and a certain amount of movement must be allowed for. While making the lower impression we have the patient raise the tongue and move it around as if to clear the buccal and labial spaces of food. We limit the movements of the tongue to this only and it is not necessary for the patient to extend the tongue out of the mouth or move it to the extremes. If we allow the full range of movement of the tongue we will lose the lingual-peripheral adaptation (Fig. 16.) and a great deal of our chance for retention on the lower denture will be lost. The reason the patient is instructed to hold the mouth open widely while the impression sets is so that the muscle-pull of opening the mouth to the extreme will not dislodge the finished lower denture.

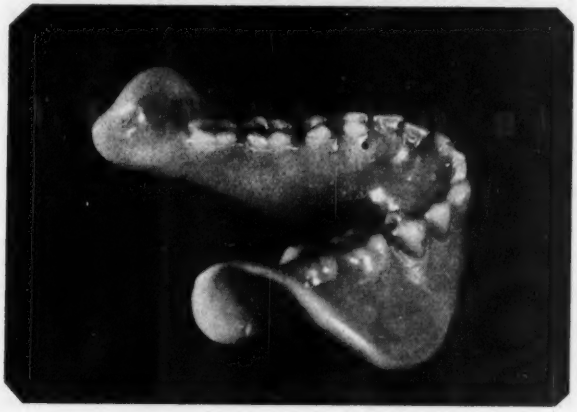


Fig. 16.—Lateral occlusal view of typical lower.

When this part of the denture is satisfactory the impression is completed the same as the upper by first having the patient close on wet cotton rolls, and then placing a very small amount of the special impression plaster around the peripheral border to complete our buccal-labial-peripheral seal. We then apply inward and upward pressure on the cheeks and lower lips to mould the excess material away so there is no over-extension. The peripheral borders as finished in this manner will be the exact contour of the peripheral borders of the finished dentures. The impressions are then removed and the casts poured. It is not necessary to box the impressions though there certainly is no objection to doing this. We take an indelible pencil and go around the entire peripheral border of both upper and lower impressions, marking a line about a quarter-inch down on the outside of the impression. This gives us a line to which to trim the stone just before it sets so that we will have a reproduction of the thickness of the entire peripheral border. A good mix of stone is important. We thoroughly mix the stone according to directions and then place it under vacuum to remove the air from the mix. It is then taken out of the machine, placed in a towel and some of the moisture absorbed. It is important to have a good vibrator and this stone which is quite stiff in consistency, is vibrated carefully into the impression. If metal split-cast plates are used the cast half of the plates is placed on the bench and stone is built up on it. (Fig. 17.) The impression is then inverted on this stone and gently

vibrated down to make the base of the cast as thin as possible. The stone is then moulded up around the outside of the impression so that it covers the indelible line. Just before the stone has set, the excess around the peripheral border is cut back to the indelible line. This serves the same purpose as boxing the impression if it is carefully done, but in order to do it the stone must not be thin. We have some squares of plastic on which we pour our casts and as soon as the stone begins to set it is placed under water until set. This is the same principle that is used when a cement sidewalk is kept wet while the cement is setting. The special impression plaster or Truplastic which is used to take the impressions of the peripheral borders should be painted with a

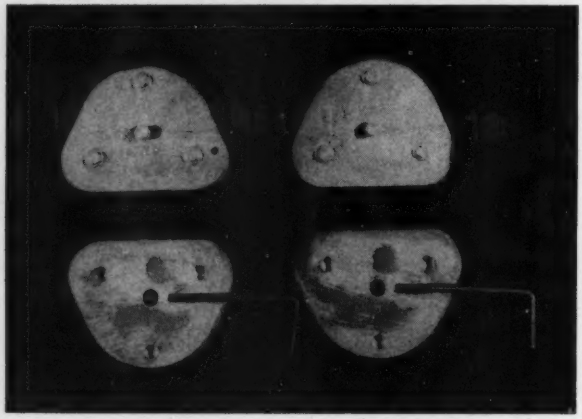


Fig. 17.—Split Cast Remounting Plates which were designed by the author. These make accurate remounting of the cases after curing.

coat of sodium silicate or water glass before the cast is poured. This will facilitate separating and keeps the plaster from absorbing moisture from the stone around the periphery in the initial set. If metal split-cast plates have not been used then, after the casts have been trimmed, the bases should be grooved before mounting on the articulator so that the casts may be removed from the articulator and again replaced after the dentures are cured. This makes it possible to correct any changes that occur which are beyond our control between the time when the cases are flasked and the time when they are removed from the flasks. When the cases are remounted on the articulator it will usually be found that the bite is open from ½ to 1 millimeter. By use of the injection method or by use of spring clamps this change can be kept to a very minimum and a few will come out demonstrating practically no change. A small amount of opening does no harm; in fact, it is an advantage as it allows us to do our occlusal correcting and milling and still complete the case at the original vertical opening.

FOURTH APPOINTMENT.

Recording Maxillo-Mandibular Relationships.

Many otherwise good cases have been ruined because of an incorrect bite. There are many methods of recording the bite. Before check-bites can be

taken the casts should be mounted on the articulator that is to be used. They are mounted in approximate centric by means of the wax rims. The impressions should not be removed from the casts until this step has been taken, and be sure that the incisal pin of the articulator is set when they are mounted

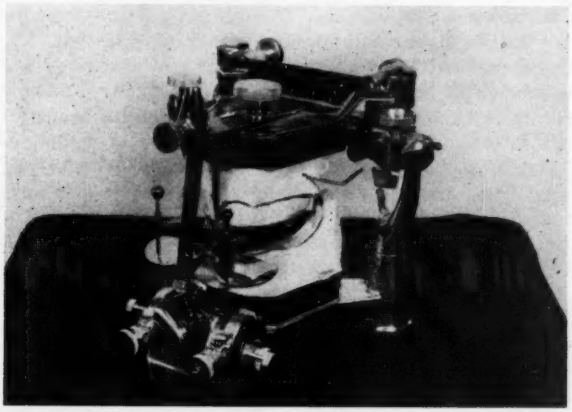


Fig. 18.—Relationship Recorder mounted at previously determined Vertical Opening.

so that the vertical opening will be preserved. (Fig. 18.) The impressions are then removed from the casts and the bases cleaned up and the wax rims removed. All undercuts on the casts should be blocked out with wax and these undercuts removed from the plastic bases. The casts are then tin-foiled and

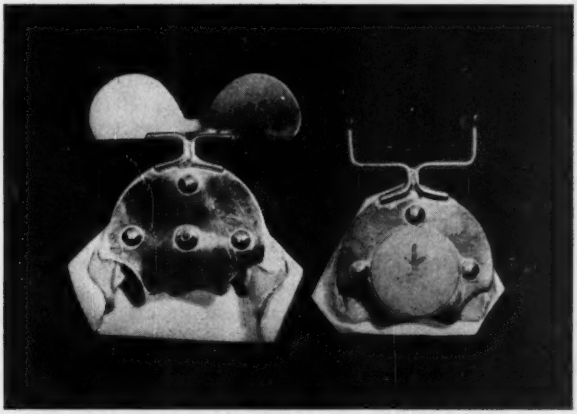


Fig. 19.—Relationship Recorder designed by the author is used for taking Plaster check-bites.

the impression bases are coated with zinc oxide paste and seated to place on the tin-foiled casts. This gives us an exact reproduction of the tissues as they were recorded by our final impressions. (Fig. 19.)

The relationship which you should record depends upon the articulating instrument which you are going to use for the case. The more fully adjustable the instrument, the more valuable complete records will be. If your instrument has no adjustable condyles, then the important thing to record is accurate centric at the required vertical opening. Other check-bites or records would be of no value and a waste of time. If your articulator has adjustable condyles, such as the Hanau articulator and others of this type, it is important to take two records, centric and protrusive. If you are using a fully adjustable articulator such as the Co-ordinator, the House, the Stansbury Tripod or the Gysi Trubite Articulator, then all four check-bites, centric, protrusive, right and left lateral, should be taken and will be of value. Three of the instruments just mentioned have, besides condyle adjustments, a gothic arch control which works against the incisal pin. Here lateral check-bites are valuable for the instrument can be set to follow the patient's lateral gothic arch path. Before deciding which records to take, again classify your instrument—non-adjustable, partially adjustable, or fully adjustable. With non-adjustable, take centric. With the partially adjustable, take centric and protrusive. With the fully adjustable take centric, protrusive and right and left laterals. It is possible to build good dentures by using any of the articulating instruments and the mouth can even be used as an articulator. They do not determine the dentures, but it is the skill of the dentist and his adaptation of his knowledge in the construction of those dentures which is most important. The articulator is a valuable aid in the construction of dentures and the more fully adjustable the instrument is, the more the refinement which can be put into the occlusion.

You probably have all read of at least two men who have discredited the use of articulators and, in my opinion, their essays have contributed nothing to the advancement of Prosthetic Dentistry, in fact, I think they have done much harm. They can undoubtedly build dentures without an adjustable articulator, as I think most any of us can. But that is no reason to discredit the man who will work to finer detail and build more accuracy into his cases by properly using an adjustable articulating instrument. I have no doubt that they believe they are right but that does not make all others wrong. There are many roads that lead to Rome and many right ways of building dentures.

Though I do not consider it the best way to build dentures, as I stated, some dentists prefer to use the mouth as an articulator and at this point, before going into the taking of our relationship records, I will give you one way that this can be done.

Assuming that the casts have been mounted on a hinge with a vertical stop in correct centric—and I would prefer a gothic arch tracing with a plaster check-bite to determine this—the teeth are set up on a flat plane. They are then tried in the mouth and a wax bite is taken in protrusive. This is examined to see whether the anterior teeth and posterior teeth are contacting at the same time. If only the incisors touch we then steepen the curve in the molar region and take another wax check. As long as they do not contact in the posterior at the same time as they do in the anterior, it means we do not have our occlusal curve steep enough to harmonize with the patient's condyle path. If we have three-point contact in all positions those dentures will be stabilized but any set of dentures that does not have at least a three-point balance in all positions will continually be subjecting the base tissues to

trauma, which will cause soreness, resorption of the ridges, and a gradual loosening of the dentures as a result. If you can balance a set of dentures you can use the mouth as an articulator and the end result may be very good. For most men it is more difficult to get a good result by this method than to use an articulator which is at least adjustable to protrusive, and balance the teeth accordingly on the instrument. While a partially adjustable articulator may not duplicate all details of movement, it does serve as a caliper to show us the steepness of the condyle paths at least, and how we must set the teeth to co-ordinate them with the patient's movements. The use of a fully adjusted

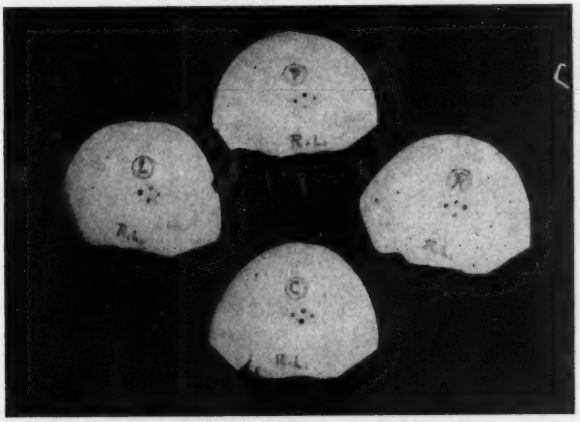


Fig. 20.—Plaster check-bites used for setting the Co-ordinator Controls to reproduce the Maxillo-Mandibular Relations.

instrument is, of course, a still greater aid due to the fact that the teeth will articulate in the mouth just as they do on the articulator if it has been properly set. This applies, however, only to the fully adjustable instruments. Regardless of what kind of an articulator is used, I prefer using plaster check-bites in combination with a centre-bearing gothic arch tracing to secure centric, and the other check-bites if they are required. (Fig. 20.) This eliminates all guesswork in securing a balanced, accurate centric and it is a means of adjusting any articulator to the required relationships for that instrument. The more fully adjustable the articulator used, the less grinding will be required at the chair to correct the occlusion after the dentures are finished. It is a means of giving our patients dentures with a maximum of efficiency and comfort, providing good impressions have been taken. Fully adjustable articulators accurately reproduce our relationship records. A check with articulating paper will reveal multiple cusp contacts in all positions, both on the working and balancing side, and very seldom is it ever necessary to grind the occlusal surfaces of the posterior teeth when the dentures are placed in the patient's mouth.

FIFTH APPOINTMENT.

Set-up Anterior Teeth.

At this appointment the anterior teeth are set up for aesthetics and phonetics. Here again, there is no rule but the results will lie with the judgment of the operator in co-operation with the ideas of the patient. If the aesthetics of previous dentures has been good this can be used as a base upon which to improve. Never be satisfied until the new ones look much better than the previous ones. There is no such thing as perfection here and all dentures could be improved. In fact, to most patients, aesthetics means more than the

Fig. 21.—The new T Mould Posterior Tooth carved by the author. Note the multiple cusp contacts possible and the accentuated carvings eliminating recarving after milling.

details of balanced occlusion. Don't allow yourself to get the reputation for dentures that fit and function alone and not couple with this a reputation for making the most natural and best-looking teeth. One is just as important as the other. If you have no previous record of the patient to go by, it is important to have the patient look up any photographs which he may have that were taken at any age when the permanent teeth were in place. By the use of a magnifying glass it is possible to determine the tooth form and arrangement from photographs which may have been taken many years before. Also the use of advice from other members of the family is valuable in getting a set-up which is satisfactory to the patient and which, to them, looks as it should. After the anterior teeth are set to satisfaction the posteriors are set up.

At this point I would like to describe to you the new posteriors which I have recently carved. (Fig. 21.) They are known as the T Mould. I have no interest in this tooth except that I think it is giving us something we never have had before in posterior teeth. I have been using this tooth for some time now and find it is giving my patients better function than they have ever enjoyed with previous teeth. Since artificial teeth function on ridges covered

with sensitive membrane, it seems they should be made as sharp as possible. They have to chew food with approximately one-tenth the pressure that is exerted on natural teeth. Artificial teeth of all types, after adjustment for balance in the finished dentures, are poor excuses for cutting surfaces. We tried to re-carve these surfaces with stones and diamonds but the result was rather crude and not very effective. The T Mould was carved and balanced on the Co-ordinator. The grooves have been deepened and sluice gates opened, the cusps have been sharpened and multiplied by the addition of supplemental grooves. After the wax teeth were cast in metal they were again mounted on the Co-ordinator and spot-ground and milled. These were then recarved and repolished. Several sets of teeth were carved in development before these final ones were perfected. The moulds from which the teeth are being made are from these last metal teeth and they are available in three sizes: large, medium and small. The anatomy is so accentuated that spot-grinding, if the teeth have been properly balanced, will not eliminate the cutting surfaces and they require very little recarving after milling. They are slightly narrower bucco-lingually than natural teeth, lessening the pressure on the ridges. They are wider at the neck than most posterior teeth, eliminating food pockets or the show of acrylic between the teeth. Best of all, they are easy to set up and balance and they are efficient when finished.

SIXTH APPOINTMENT.

Final Try-in.

This appointment should be repeated as many times as necessary but the patient should understand that this is final. A little extra time given for a try-in may save a lot of trouble later on. Two or three extra appointments, if necessary, are quite important. If desirable, invite other members of the family or particular friends to come in and give their advice. This will often do much toward the satisfaction of our patient. These critical friends or relatives can ruin a perfectly good set of dentures for us. How many times have we all had this happen? I now ask them to bring their most severe critics, whether it is a member of their own family or one of their close friends, and I let them understand that it is possible at this time to make any changes, whatsoever, that they may desire, providing it does not violate any of the rules for balance and articulation of teeth. We can lengthen the teeth, shorten the teeth, we can move them farther forward, we can move them farther back, we can set them straight, we can make them irregular, we can slant them out at the incisal edge, we can slant them in at the incisal edge, we can overlap them, space them; in fact, we can do anything they would like us to do, even to changing the moulds and shades, but this is their last chance. These changes must be made while the teeth are still in wax. This is the only time we can do this and after the dentures are cured they are finished. If they should change their minds after they are finished that is not our responsibility, and they should be told this. I sometimes set the teeth in hard wax and allow the patients to take the dentures home, being careful to keep them chilled previous to trying them in. They can then try them in at home and discuss them, and oft times are much happier after having done this. We do not go to these extremes with most patients, but occasionally it pays.

A prosthodontist must understand psychology in order to satisfy his denture patients. We must continually be watching our patient's mental reactions as the case progresses and we cannot relax for one moment on this phase of the work. In most cases I would say it is every bit as important as the technique we use. As Dr. House often says, "It is easier with some patients to fit the mouth than it is to fit their minds." His mental classification of patients has been very valuable to me. He classifies his patients into four groups: philosophical, exacting, hysterical and indifferent, or a combination of these.

The philosophical type is the most valuable and the one we enjoy the most. These people are intelligent; they understand what we are doing; they do not expect us to perform miracles; they are co-operative and, if we do our part, we can rest assured the case will be a success. Would that they were all the philosophical type!

The exacting type we can enjoy working for if he has coupled with this a philosophical mind. It is a pleasure to work for exacting people because they appreciate the fine detail that you put into their cases. However, there is the exacting type who carries a chip on his shoulder and has very little confidence in anyone. These are very difficult. They are often extremely intelligent and think they know everything, but they have some of the queerest ideas when it comes to dentures.

The hysterical type are usually shallow mentally. They do not want to be hurt, they get terribly upset over very insignificant things, and you never know where you stand with them. They may be fine today and tomorrow they will be all off the beam. However, you eventually get them finished.

The indifferent type doesn't care what you do or how it is done, and doesn't show much appreciation for anything you do after you've done it. There is not much pleasure in working for this type of patient, but they usually do not give too much trouble. We may have classified our patients at the first appointment but by the time we have arrived at the final appointment we know whether we were right or not.

This is the time to lay the foundation for the next appointment, which will be the patient's first introduction to the new dentures. You know by now just what to expect, but this is your last chance. The next appointment, when they come in to get their dentures, should be one that is thrilling both to the patient and to the dentist. After all the hard work that has been put into the case, it is wonderful to have the patient pleased and happy. The determining factor of success is whether we have produced dentures that satisfy the requirements that are expected. During these earlier appointments is the time to educate the patient as to what to expect and the limitations of his particular case. If during this time we have gained his confidence, we should have no trouble at the completion of the work.

CURING THE DENTURES.

The dentures are cured in injector flasks or spring clamps but not in flask presses. They are cured for 9 hours overnight in water at 165 degrees, then bench-cooled for an hour before cooling in water for at least 15 minutes. If we do not have time for the overnight cure we cure at 165 degrees for 1½ hours and then boil for 30 minutes. Then bench-cool for 1 hour and cool in tap water for 15 minutes. In my lecture on Relines, Rebases or Transfers and

Repairs I discussed the chemistry of methyl methacrylate resins and the theory of curing.

Regardless of the curing technique or the material used, it is an advantage if you will allow the case to set after it has been pressed for at least an hour before the curing process is started. It gives the plastic a chance to harden, the monomer time to be absorbed by the polymer, and it seems to give less chance for porosity to develop.

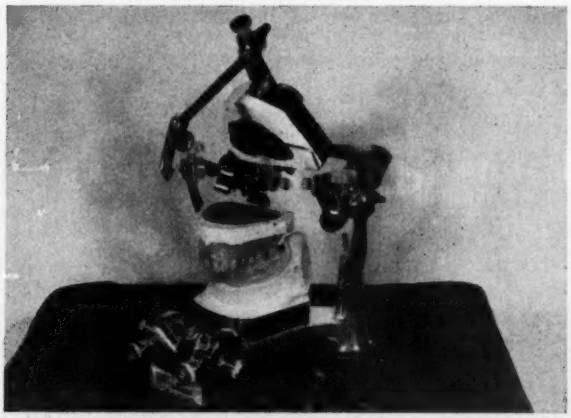


Fig. 22.—Showing remounting of cases after curing in order to correct any cuspal interference by selective spot-grinding and milling.

SPOT-GRINDING.

When the dentures are removed from the flasks after curing, they are not immediately removed from the casts. The casts with the dentures on are re-attached to the other half of the split casts on the articulator (Fig. 22.) and fastened either mechanically or with plaster. First—locate with carbon paper and correct with stones the points of interference in centric. With small stones or diamonds do selective spot-grinding in lateral and protrusive positions. On the working side in lateral position grind the lingual inclined plane of the buccal cusps of the upper and buccal inclined plane of lingual cusps of the lower; that is, buccal of the upper and lingual of the lower. On the balancing side grind either the lingual cusps of the upper or the buccal cusps of the lower. Check the bite in protrusive seeing that the incisors and molars contact at the same time. In centric the upper and lower anteriors should not contact. Most cases are open ½ to 1 mm. on the incisal pin after curing and remounting though this is minimized by either of these processes. The occlusion is corrected until the incisal pin of the articulator is touching in centric and the case runs freely in all positions with no cuspal interference.

MILLING.

The milling of the case is just a final refinement of contacting surfaces of the teeth. Abrasive paste is put on the occlusal surfaces. If the articulator has a milling device it is put in motion and the incisal pin is moved from side to side and forward and backward. The amount of milling and spot-grinding that is done on the articulator depends on the type of articulator that is used and the accuracy of the maxillo-mandibular relations that have been taken. If the records have been complete and a fully adaptable instrument has been carefully adjusted, then the refinements of the articulation of the teeth may be completed on the instrument and, when the teeth are placed in the mouth, we will find results will be the same as on the articulator. If a non-adjustable

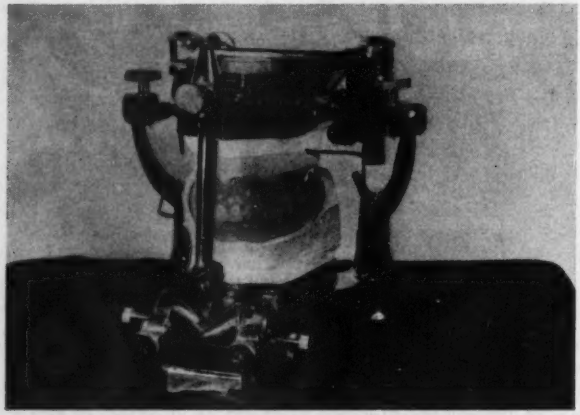


Fig. 23.—Showing the completed case on the Precision Co-ordinator which was designed by the author.

articulator is used no adjusting of the occlusion should be done except in centric as this is the only record which has been taken and everything else is arbitrary. However, all teeth should be touching equally in centric. It is better to do the corrections for lateral and protrusive in the mouth when using this instrument. If you are using a semi-adjustable instrument, one which has condyle adjustments, then the case can be balanced in protrusive and centric and a certain amount done in lateral since the condyles of the instrument do approximately follow the patient's condyle paths. These instruments do not have a gothic arch control. However, a case that has been spot-ground and milled on this type of instrument will require much less adjustment at the mouth than one which as been made on an arbitrary non-adjustable instrument. If you have a fully adjustable instrument and have taken accurate centric, protrusive, and right and left lateral check-bites and have set the gothic arch controls of the instrument as well as the condyles, the case can be spot-ground and milled completely on the instrument and, when placed in the mouth, as stated before, the patient will find no cuspal interference. In using the first two classes of articulators the final adjustment should always

be done in the mouth, but this does not mean that a good end result cannot be obtained. It does mean, however, that all this work that could be done in the laboratory on the instrument must be done in the mouth. I cannot see how anyone who builds many dentures could say that an articulator is not valuable in the construction of dentures and the more complete the articulator, the more valuable its use.

When using the Co-ordinator (Fig. 23.) set the grinder at 20. Apply milling paste and a little water to the occlusal surfaces of the teeth and mill through all ranges of movement. It is impossible to overmill or grind out of centric if selective spot-grinding has been correctly done and the incisal pin is in place. The milling merely smooths the contacting surfaces and enables the teeth to glide smoothly through all positions without interference. This

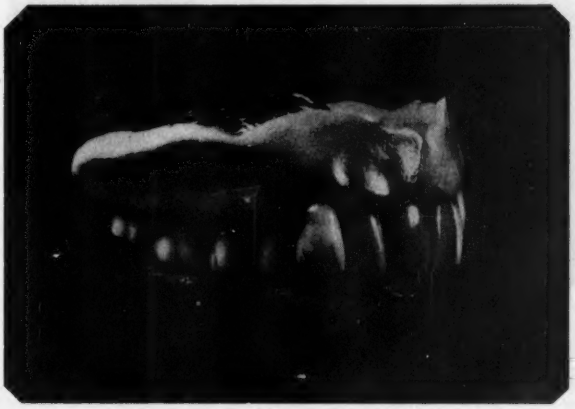


Fig. 24.—Lateral view of Gold Palate Upper.

eliminates soreness due to torque. The ground surfaces of the teeth are first polished with fine sandpaper discs, followed by pumice and then porcelain polish on a hard felt wheel. Before polishing the teeth the occlusal surfaces should be re-carved with knife-edged diamond stones or knife-edged carborundum stones running in oil or water, for artificial teeth, when finished, should have sharp cutting edges and not flat surfaces which can only mash the food. If a patient cannot cut meat with a dull knife, how can he hope to chew it with flat, smooth teeth? Far too little attention has been given to sharp teeth and their relation to chewing efficiency. Artificial dentures, at best, are poor chewing substitutes for natural teeth. Anything we can do to increase their efficiency is important. The amount of pressure which can be comfortably exerted on dentures is only from 15 to 30 pounds where, on natural teeth, patients can exert anywhere from 100 to 300 pounds pressure. For this reason artificial teeth should be much sharper than natural teeth in order to give the patient any reasonable amount of chewing ability. Flat contacting surfaces will not do this.

SEVENTH APPOINTMENT.

Delivery of the Finished Dentures.

The dentures are delivered and instructions are given to the patient. The patient will not experience any serious difficulties if he will refrain from heavy chewing during the first week, and there will be very little adjusting to do if instructions are followed. An appointment should be given for the next day and the mouth checked for any pressure spots. We use the material (Indicator Gel) which we used for our final impressions, to locate the pressure spots,

Fig. 25.—Complete Upper with Gold Palate.

should there be any. It is well to give our patients a definite appointment each day or every other day following the insertion of the dentures in order to check the mouth and also to get the patients' reaction to the new dentures and to correct any misunderstanding which may be developing in their minds. Until they have gone through the adjustment period, our responsibility is not over. We should not release our patients until their mouths are perfectly comfortable and they are happy with the results. Prosthetics is not easy but it is, to me, the most interesting part of dentistry and, if well managed, can be the most remunerative. (Fig. 25.)

In conclusion, I would like to state that the results of a precision technique will be "Dentures that Fit and Function." You will have happy, satisfied patients who will refer more denture patients and you will have a profitable prosthetic practice.

A RE-CONSIDERATION OF TRIGEMINAL NEURALGIA

GILBERT PHILLIPS, M.Sc., M.S., F.R.A.C.S.

I appreciate this opportunity to address the 12th Australian Dental Congress on the subject of trigeminal neuralgia. This condition, which must be regarded as a surgical emergency by reason of the excruciating pain suffered by the patient, will probably always remain a borderland for treatment between the dentist and neurosurgeon. Whereas the bulk of the responsibility will probably continue to fall on the neurosurgeon after the condition is well established, there are undoubtedly, on the other hand, earlier and perhaps greater responsibilities for the dentist in the management of dental pain. There would now seem to be little doubt that previous dental pain experienced is the basis of subsequent paroxysmal neuralgia, and in view of the remarkable advances which have been made in the past 10 years in our knowledge of neurophysiology, this would seem to be an appropriate time to re-consider the problem, mainly from the aspect of its aetiology.

In 1933 Sir Charles Sherrington's book entitled "The Brain and Its Mechanism" was published. He was stimulated to do this by the then recent work of E. D. Adrian at Cambridge, who had succeeded—for the first time—in recording a single action potential of a single nerve impulse in a single nerve fibre. Sherrington's school had been concerned in neurophysiological research relating to reflex mechanisms, and Adrian's work made it possible to link up impulse patterns with their reflex effects. In retrospect, Sherrington's book is perhaps of greatest importance now, as an index of the end of a certain neurophysiological epoch. He had stressed two things in its text—the phylogenetic development of the nervous system with the accumulation of receptors at the head end, and a corresponding increasing complexity in the nerve nets of the fore-brain. He likened Adrian's action potentials to little spots of light which moved along nerve trunks into the spinal cord, and ascended through more complex synaptic communications ultimately to reach the cortex of the fore-brain. He envisaged myriads of these when the individual was in action, and depicted the decreasing activity and quiescence which became associated with resting conditions, such as in sleep. He made no reference to the possibility of trains of impulses circulating continuously in the brain at all times. He described, secondly, the brain as an "in/put-out/put signalling system," and implied that the drive for activity and the resulting intensity of impulse conduction came from without.

From that time a new concept developed. Kubie, a psychiatrist, suggested the possibility of neural circuits within the brain, and this theme was extended by the researches of Lorente de No at the Rockefeller Institute, and by Dusser de Barenne and Warren McCullough. In this university A. K. McIntyre also demonstrated that the quick component of nystagmus was based on the interpolation of an inhibitory internuncial circuit in the pons. The findings of these workers all suggested that there may be closed circuits within the central nervous system which might be charged with trains of nerve impulses from external sources, and that these would continue to circulate indefinitely, quite below any conscious level, but might be made available from time to time in memory if released by associated sensory experience. A close analogy

might be drawn between this concept and the conditions which operate in modern computing and memory electronic devices. Here one finds, basically, a circuit into which may be fed electrical pulses, corresponding to certain information, and these are then capable of recovery and recording at any future time. The circuit must contain a source of electrical energy, and some type of delay mechanism. For the latter purpose a mercury line or tank is used, which is placed in series in the circuit and which is able to convert the electrical pulses into supersonic acoustic energy which is then transmitted down the mercury line and reconverted again to corresponding electrical impulses. This delay enables a series of pulses representing information of various types to be packed in the delay tube and transmitted indefinitely around the circuit. By appropriate devices these may be read off and recorded. Recently, Norbert Weiner, of the Massachusetts Institute of Technology, with the collaboration of other mathematicians, biologists, physiologists and physicists, has made this concept of electronic circuit activity more precise by publication in 1949 of a book entitled "Cybernetics," which is described as a study of control and communication in the animal and machine.

One may perhaps enquire what all this has to do with trigeminal neuralgia. In reply, one may say that previously, regarding the nervous system as an "in/put-out/put signalling mechanism," the cause of trigeminal neuralgia was thought to be some pathological derangement of the pain receptors or their fibres in the trigeminal nerve. This proposition was, of course, substantiated by the fact that interruption of peripheral trigeminal fibres by one means or another abolished the attacks of pain. This interpretation, however, now requires review. In the first place, definitively, according to the Oxford, Webster and the International dictionaries the term "neuralgia" may only be used if the pain is severe, paroxysmal, referred to the distribution of a nerve and, most significantly, in the absence of any lesion of the nerve. It is true that if one dissects out the infra-orbital nerve in a case of trigeminal neuralgia of that branch, histological examination of the extensions of the nerve into the skin does not reveal any local neural pathology. Significant is the fact, too, that it is not painful stimulation which provokes spasms of trigeminal pain but the lightest touch of cotton wool, a puff of air or of cold stimulation which immobilises the subject in a dreadful spasm of acute pain. It may be clearly shown by local anaesthesia that the pain receptors and their fibres have not achieved some new low threshold or have become perverted in their receptivity, as local block anaesthesia, to a degree which abolishes painful pin-prick but still leaves the larger conducting fibres intact, will not prevent spasms of pain by touching the skin. It must be remembered that trigeminal neuralgia is quite unlike other types of trigeminal pain—either from reflex or central causes. With a true trigeminal tic, the patient is completely free from pain at one moment, experiences maximal pain the next, and is again completely free immediately afterwards. The onset and offset are instantaneous, and the pain is of very short duration. It may be compared to a rectangular curve in which the pain experience arises vertically from the base-line of no pain, reaches a maximal horizontal level for a second or so, and then drops perpendicularly to the base-line again. No such pain may be established by a peripheral stimulation of pain receptors or their fibres. It is true that the onset, with peripheral stimulation, may be very sudden, but the pain experience diminishes over a definite time interval.

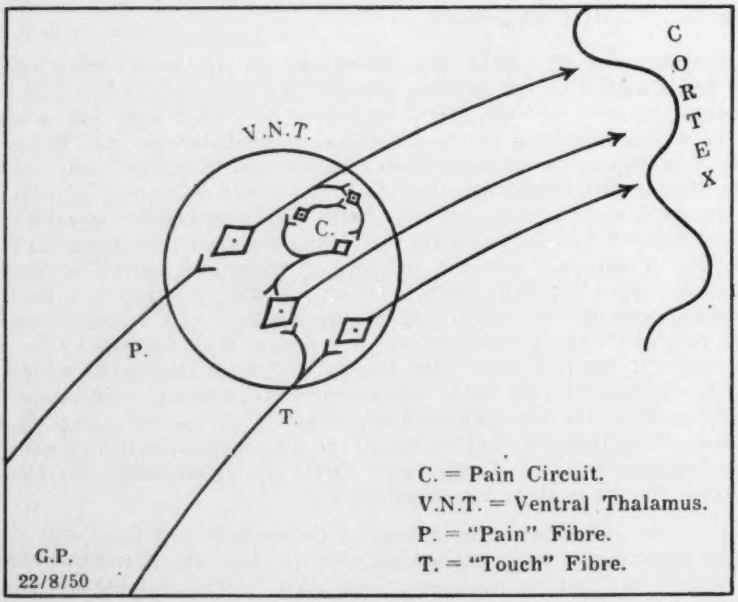
There are many queer factors involved in this symptom, notably that over 60% of the cases occur in women, and there is an equal or even greater preponderance of its incidence on the right side of the face. Wilfrid Harris suggested that this might possibly be related to the more effective use of the toothbrush on the left side of the mouth, held usually in the right hand by right-handed persons. Those of you who, with me, may come to agree that there is better evidence for an essential central basis, may feel that the combination of hysterical soil and left cerebral dominance, may imply the operation of central mechanisms.

The enquiries of Hopkins into trigeminal pain are most interesting. He was first directed to the problem through the study of cases of caisson-neuralgia. Caisson workers, after decompression, often complained of severe attacks of pain referred to the trigeminal field. Reference was frequently made to particular dental areas. Going back in the history of many of these cases, Hopkins discovered that there had been severe dental operative trauma in relation to teeth at some previous time. This observation appeared to tie up with Wilfrid Harris's statement that dental trauma, or severe dental infection, was of importance in the aetiology of trigeminal neuralgia. Hopkins then took a series of individuals in whom operative dentistry was required. One group was treated roughly without anaesthesia, and a second group only after full block anaesthesia. In the first group Hopkins found that with stimulation in the trigeminal field, usually performed electrically within the mucous membrane of the nose, severe pain was frequently experienced, and was referred to the traumatised dental area. In the second group no pain resulted. The inference must be made that the previous central reception of pain impulses was the fundamental factor in subsequently establishing reference of pain to the traumatised areas.

Does our contemporary knowledge of the anatomy and physiology of the human brain enable us to explain the clinical observations referred to? At the outset it is a fact that all forms of sensation, both painful and non-painful, which arrive at the thalamus converge on those cells constituting the posterior part of the ventral nucleus. As far as we know there is no special group of pain-receiving cells, touch-receiving cells, pressure-receiving cells, etc., and there must therefore be a considerable overlap at this point. This would appear to be desirable since a pin applied to the skin with gradually progressive pressure is felt firstly as touch and is sharply localised, and then as pain and is localised to the same site. Again, we know as the result of the work of many investigators that closed neural circuits exist both at the thalamic level and between the thalamus and the cerebral cortex. In the accompanying diagram one sees pain and touch fibres arriving at the ventral nucleus of the thalamus. The presence of a local circuit is shown, and the overlap between pain and touch fibres indicated.

During operative dentistry pain impulses are set up, they are received at the thalamus, transmitted to the cortex where the pain is localised, and at the same time local pain circuits are charged with impulses, which may continue to be transmitted indefinitely within these circuits. Analogy with the electronic memory machine is close, as we have a delay mechanism at the synapses, a source of energy in the polarised surface of the axons, and symbols in the form of nerve impulse potentials representing the result of peri-

pheral pain receptor stimulation. It seems reasonable to conclude that, through some local change within the pain circuits (a change which may not occur for some years after the circuit has been charged up), the circulating pain impulses may be released by touch impulses, converging on cells in the thalamus in a field of mutual overlap and then being transmitted to the cortex are experienced as a sudden dramatic pain which disappears with equal suddenness.



The importance of this concept from the point of view of a dental community lies in relation to the original charging of pain circuits with nerve impulses. If pain is not experienced by the subject during operative dentistry, it now seems likely that trigeminal neuralgia will not appear in later years. It is therefore the responsibility of the operator always to ensure adequate local anaesthesia before peripheral pain receptors are stimulated.

DENTAL TREATMENT

Vacation Period.

It is suggested where possible that arrangements should be made for a colleague to undertake any urgent treatment required by your patients during your absence on vacation—particularly during the Christmas-New Year period. Your Executive would appreciate your co-operation in this.

The DENTAL JOURNAL of AUSTRALIA
N.S.W.

EDITORIAL DEPARTMENT

THE CHANGING SCENE

There is a constant need for the individual to adjust his reactions to his environment. On all sides the cry is heard that danger lies ahead. Labour on the one hand clamours for more wages whilst the industrialist seeks more production.

Social amenities have been added, on the one hand, to the sustenance of the worker and, on the other hand, have disappeared by simple extraction through high costs of living.

The experts fail to agree as to the root cause of the ills with which society is stricken, or do not have the courage to employ frankly any method except the time-honoured "transference of responsibility."

It is therefore interesting to note that thought has been given to the setting up in the appropriate places of courses of study designed to deal with the problems of labour and industry. The chances are that by the time these plans bear fruit the immediate problem will be one of salvage from the wreck rather than a preventive procedure.

The dental profession, being a small more or less self-contained unit in the community, finds itself in somewhat of a dilemma. In order to survive as an economic unit, due cognizance must be given to adjustment of fees set for various types of treatment available. Today, probably more so than in other days, it is vitally important for the practitioner to develop a considerable degree of elasticity in the range of treatment which he is willing to provide.

Assuming that the standard for any particular treatment selected in the range is maintained at a high level and is based on sound principles and procedures, then there should be little concern or alarm.

The recent survey of fees, however, has disclosed a serious trend in certain directions. It should be palpably clear to all that in some cases cited no practitioner could possibly survive the economic storm on the fees quoted—remember that the fees were samples presented as averages from a wide range of replies.

An explanation of the low figure in some cases would seem to be a deliberate misrepresentation of the true position, an action which was not only dishonest but dangerous; for, if the information ever reaches the wrong hands, a most invidious disservice will be the end-result.

Many practitioners, if they were seriously taxed with the necessity for

assessing their services, could not do so and it is high time that a more realistic approach was made to the problem of evaluating the various costs of each individual service provided by the practitioner. If this were done, many uneconomic practices could be eliminated by the substitution of sensible procedures.

Today is the time to evaluate your services. The public as a whole is keenly aware of the rising costs of services of all kinds. It is therefore the most appropriate time for a re-assessment, particularly of the fees generally charged for various phases of conservative dentistry and exodontia.

The costs to the practitioner have steadily risen and, with the last sudden leap, the necessity for some action is imperative.

It is essential, however, that an intelligent application of any adjustment should be made and this must be accompanied by a suitable explanation to the patient when he raises a query.

Many examples of disgruntled patients are due to thoughtlessness on the part of the practitioner in acquainting the patient with the various aspects of the problems confronting the practice of dentistry today. Numerous examples are met and dealt with by the officers of the Association, in which patients seek enlightenment on the question of fees. These situations are caused through ignorance of a few basic principles.

If the members of the profession do not secure their individual economic status by appropriate and intelligent action, then the changing scene will indeed lead to an unhappy state.

Opportunity knocks but once. Action omitted by the profession gives the initiative to some other group.

News and Notes

BLUE MOUNTAINS DIVISION

On Thursday, September 21, 1950, the Blue Mountains Division held their Annual Sports Day. Although the attendance from members of the Division was rather poor, all who participated in the golf and bowls events really enjoyed themselves.

At the conclusion of the day's play, both bowlers and golfers assembled at the Leura Golf Club, where the President of the Division (Mr. M. J. Griffin) made the presentations to the winners of the various events.

The following were the winners of the sporting events:

GOLF.

18-Hole—4-Ball v. Par: R. Goodwin Leeder and L. Noone (plus 4).
Best single scratch score: A. Brown (plus 1).
Best first 9 v. Par: S. Carr and M. Spencer (plus 4).
Best second 9 v. Par: A. Brown and A. Poulton (plus 4).
Longest drive: A. Prichard (255 yds.).
Special prize: A. Doughty and T. Kenny.

BOWLS.

Winners: W. Chesher and O. Stenmark.
Runners-up: R. Reid and T. Purtell.

PRACTICE FOR SALE

Dental equipment, complete for two surgeries. Apply Mrs. Harvie, 21 Furneaux Street, Forrest, Canberra, or ring Canberra, B 509.

HONORARY DENTISTS

The services of an Honorary Dentist are required for the "Mater Dei" Orphanage at Narellan. Up to the present this charitable work has been carried out by a practitioner who is now unable to continue owing to ill-health.

Any dentist who could offer his services is requested to communicate with the Reverend Mother at the Orphanage. (Telephone: Camden 19.)

Association Activities

AUSTRALIAN DENTAL ASSOCIATION

Extract from the Minutes of the Annual Meeting of the Association held in the Council Room, B.M.A. House, 135-137 Macquarie Street, Sydney, on Friday, 25th August, 1950, at 9.15 a.m.

Present: Dr. Stanley Wilkinson, President, in the Chair; Dr. J. V. Hall Best, Vice-President; Dr. J. S. Baird, Interstate Vice-President; Dr. Gershon Bennett, Honorary Secretary; Mr. R. Noel Peverill, Honorary Treasurer.

State Branch Representatives: Dr. Brian Ferguson, Dr. Haddon Kemp, Queensland; Dr. E. R. Magnus, Mr. R. Harris, New South Wales; Dr. J. M. Wark, Mr. A. R. T. Greenwood, Victoria; Dr. M. W. Evans, Mr. B. W. Leach, South Australia; Mr. T. Flintoff, Mr. S. Hedges Dale, West Australia; Mr. R. G. Fitzgerald, Mr. P. F. C. Mattingley, Tasmania.

In attendance: Mr. A. Jackson, Queensland Branch Secretary; Mr. F. Herbert, Victorian Branch Secretary, as observers.

Annual Report:

Citation of J. Campbell Wilson: The President stated that the name of Dr. J. Campbell Wilson should have been included with those of Drs. P. C. Charlton and J. M. Lewis in connection with the Citations of the Royal College of Surgeons under the heading of Honours and Awards.

Goodes Report: In reply to an enquiry from Victoria the President stated that the Federal Officers considered the Goodes Report to be outdated and that that was the reason for a meeting not having been held early in 1950 to discuss it.

Alien Dentists: Each Branch is requested to prepare a factual statement to support the Association's opposition to the registration in any State of Australia of overseas dentists who do not hold a qualification acceptable to the General Medical Council of Great Britain. Should any State Act be threatened in this matter, the Branch concerned may appeal to the Federal Officers for advice and support.

Life-saving drugs: On Victoria's suggestion, it was resolved that appropriate action should be taken to obtain for the dental profession the right to prescribe certain drugs for free issue on a similar basis to the medical profession.

Repatriation Dental Treatment: Consequent upon discussion that dental treatment for Repatriation cases was unsatisfactory to the participant dentists because there was no professional representation on the administrative staff, the Federal Officers were instructed to investigate the administration of the Repatriation Dental Service and to take appropriate action.

Importation of dental materials: In reply to an enquiry from Victoria as to whether there was any further information available regarding the importation of dental materials, the President stated that this matter had been investigated by the Vice-

President, and that the Customs Department would be unlikely to agree to accept the Standards Committee as its consultant.

Fulbright Agreement: Victoria suggested that some of the money available under the Fulbright Agreement might be spent in bringing a lecturer from America for a tour of Australia rather than paying the fares of members to America.

National Health and Medical Research Council:

The President stated that he was very pleased to note a much greater appreciation by the National Health and Medical Research Council of the Association's policy and that, of the last allocation of funds for research, ten per cent. was voted for dental purposes.

Prevention of Dental Caries:

The Report upon the Prevention of Dental Caries compiled by a Committee appointed by the Australian Dental Association was before the meeting and the President stated that this most excellent report had been presented to the National Health and Medical Research Council for consideration at its next meeting and that it appeared probable that the future Government policy would be directed mainly towards prevention.

13th Australian Dental Congress:

Dr. Ferguson (Queensland) announced the appointment of Professor S. F. Lumb as President of the Thirteenth Australian Dental Congress to be held in Brisbane. The Queensland Branch also recommended that the Congress be held in May, 1953.

Revision of Constitution:

The report of the Round Table Conference relative to the revision of the Constitution was before the meeting, and the President stated that it now appeared that all States with the exception of Tasmania were in favour of plural voting on a fixed basis of: New South Wales—four votes; Victoria—three votes; Queensland, South Australia and West Australia—two votes each; Tasmania—one vote. It was intended that the revised Constitution should be submitted to a special meeting at which proxies could act so that a decision could be made as soon as possible.

Report of Standards Committee:

The report of the Standards Committee was before the meeting and Dr. Wark, the Chairman of the Committee, reported that the list of certified materials was to be published. The position at present was that certain public institutions were using materials which did not comply with the standards laid down. On the Committee's recommendation, the Report was amended to incorporate the following:—

(a) That this Association maintains that, in all cases where the Standards Association of Australia has adopted a dental standard, Government and semi-Government contractors should be obliged to certify that their product complies with this standard.

(b) That at the forthcoming meeting of the National Health and Medical Research Council the Australian Dental Association's representative should describe this Association's accreditation procedure and draw attention to the fact that certain government departments and public institutions are using sub-standard materials.

(c) Immediately following this meeting the Federal Officers should make representations to the various departments of the Commonwealth Government and maintain that, on the adoption of an Australian dental standard, all future tenders for supplies of the product should specify that the material must conform to the relevant standard.

(d) At the same time the various Branches should individually initiate action in their own States to secure this end.

Membership of the Federation Dentaire Internationale:

The Federal Officers were authorised to apply to the Federation Dentaire Internationale for membership at a subscription not exceeding an amount of fifty pounds (£50).

Election of Officers:

The election of officers resulted as follows:—

President: Dr. J. V. Hall Best.
Vice-President: Dr. K. T. Adamson.
Interstate Vice-President: Dr. J. M. Wark.
Honorary Secretary: Mr. Robert Harris.
Honorary Treasurer: Mr. N. E. Edney.

Appointment of Representatives:

National Health and Medical Research Council: The Chairman declared the President, Dr. J. V. Hall Best, to be the Association's representative on the National Health and Medical Research Council.

Standards Committee: It was resolved that Dr. Edward Marks be appointed Chairman and Professor Down, Professor Worner, and Mr. A. R. T. Greenwood be appointed members of the Standards Committee.

Flying Doctor Service: Dr. Stanley Wilkinson was appointed the Association's representative on the Flying Doctor Service.

Appointment of Auditor: It was resolved that Messrs. C. O. Beck and Wayland be appointed the Association's auditors.

Annual Report (Re-opened discussion):

National Dental Health: The officers were instructed to rewrite the Memorandum of 1944 in the light of subsequent resolutions of the Federal delegates and the changes in the world situation, such to be submitted to the various constituent bodies for approval or otherwise.

Farewell by Dr. Wilkinson:

Dr. Wilkinson stated that this was the last time he would conduct an Annual Meeting of the Association and pointed out that it was a great personal satisfaction to him to feel that the Association was basically more united and in greater public esteem than at any other time in its history.

A vote of appreciation was expressed by the Council to the outgoing officers.

The Chairman declared the meeting closed at 1 p.m.

NEW SOUTH WALES BRANCH

Extract from Minutes of Meeting of Executive Committee held in the Council Room, B.M.A. House, 135-137 Macquarie Street, Sydney, on Tuesday, 11th September, 1950, at 7.30 p.m.

Present: Dr. E. R. Magnus, President, in the Chair; Dr. A. G. H. Lawes, Vice-President; Dr. R. M. Cloutier, Honorary Treasurer; Mr. N. E. Edney, Mr. H. McD. Finnie, Mr. W. A. Grainger, Mr. R. Krauss, Mr. R. G. Leeder, Mr. J. W. Skinner, Mr. H. R. Sullivan, Mr. Ralph Tompson, Mr. R. W. Wilson, Mr. R. Y. Norton, Mr. F. R. Reid; Dr. J. D. Oddy, South Coast Division; Mr. C. D. Reynolds, Newcastle and Hunter River District Division.

Apologies: Dr. F. E. Helmore, Vice-President; Dr. J. V. Hall Best; Mr. L. Mackenzie, Blue Mountains Division; Dr. J. D. Benson, North and North-West Division; Dr. A. G. Rowell, Western Division.

In attendance: Mr. Robert Harris, Secretary.

Annual Federal Meeting: The President, as one of the New South Wales Delegates, reported the result of the elections at the Annual Meeting of the Australian Dental Association.

Mr. Harris gave a resume of the decisions reached regarding the main items dealt with at the Annual Meeting: Alien Dentists, Life-saving Drugs, Repatriation Dental Treatment, Leases of Deceased Dentists, the Thirteenth Annual Dental Congress, Revision of the Constitution, and Grant-in-Aid. In regard to the last-mentioned item, he stressed the fact that the resolution had been passed (3-2) with New South Wales and Queensland voting in the negative and Tasmania abstaining after a strong warning by the President of the inadvisability of passing such a resolution.

Discussion then arose in connection with the advisability of passing a resolution indicating the Association's recognition of all dentists whose qualifications are acceptable to the General Medical Council of Great Britain when the Dental Board of New South Wales does not recognise the right of all such dentists to practise here.

It was agreed to leave this matter in abeyance until such time as the minutes of the Annual Federal Meeting were circulated.

It was resolved that the report of the Delegates to the Annual Federal Meeting be received and that the appreciation of this Executive of the work of these Delegates be recorded.

Business Arising from Minutes:

Conference with representatives of Suburban Dental Groups: It was resolved that the Suburban Dental Groups and the St. George Dental Association be written to, informing them that at the Conference held recently between Group representatives and the Honorary Officers the suggestion was made that further conferences between Group representatives and the Executive be held and that the Groups be further informed that the Executive is prepared to consider favourably such a suggestion if the Groups desire such further conference.

Reports from Committees:

Divisions: Mr. Krauss, the Chairman of the Divisions Committee, reported that arrangements for the convention at Armidale in August, 1951, were well in hand, the University will be available and there will be accommodation for about one hundred and fifty persons in Armidale.

Sports: Mr. Reid, the Chairman of the Sports Committee, reported that the Moxham Cup, which had been competed for at the Congress Sports Day Golf Competition, had been won by Dr. E. S. King. As the competition had been conducted in conjunction with Congress activities, there had been no cost to the Association involved.

This report was received.

Membership:

New Members: It was resolved that the following dental practitioners whose applications were in order and who had paid the requisite subscriptions be admitted to membership of this State Branch as from 11th September, 1950:

Clapp, Cedric Norman, B.D.S.; Costello, John Harold, B.D.S.; Egan, Patrick Joseph, B.D.Sc.

Correspondence:

Research Scholarship: Letters dated 18th August and 8th September, 1950, from the Registrar of the University of Sydney were read and the Secretary reported that the Research Committee had considered the letter of 18th August and recommended the extension of the Scholarship for another year and that the financial position of the Research Account would allow of this, as at the present time it had a balance in hand of £625.

It was suggested that, if the Association agreed to this extension, the Walter and Eliza Hall Trustees would probably agree too.

It was resolved that this Association make available for a further year half of the salary of the Australian Dental Association, New South Wales Branch, and the Walter and Eliza Hall Trust Research Scholar.

Dental Attendants' Hours of Work: The Secretary reported that letters had been received from several Divisions relative to the question of a change in the spread of hours worked by dental nurses but Mr. Edney intimated that, as the Dental Attendants and Secretaries' (State) Award had still about eighteen months' duration to run, the Industrial Commission would not hear any claim for an alteration at this stage. It was understood that the co-operation of the dental nurses would be forthcoming in this regard.

Sydney Scientific Film Society: A letter dated 21st August, 1950, from the Chairman of the Convening Committee of the Sydney Scientific Film Society was read and Mr. Sullivan intimated that the Institute of Dental Research had appointed Mr. Ludwig as its representative.

It was resolved that a letter be sent to the Chairman of the Convening Committee, advising that the Association is interested and willing to co-operate and that, if necessary, a representative will be appointed.

Donation from St. George Dental Association: A letter dated 28th August, 1950, from the St. George Dental Association, forwarding a donation of £10/10/- to the Benevolent and Provident Fund, was received and the Secretary reported that a suitable reply had been sent.

The meeting terminated at 10.50 p.m.

Minutes of General Meeting of the Association held in the Lecture Hall, B.M.A. House, 135-137 Macquarie Street, Sydney, on Tuesday, 26th September, 1950, at 8 p.m.

Present: Dr. E. R. Magnus, President, in the Chair, and an audience of 105 members and visitors.

Apologies: Drs. J. V. Hall Best, R. M. Cloutier, and E. O. Watson, and Messrs. N. E. Edney, and A. O. Watson.

Congress: In opening the meeting the President stated that the Twelfth Australian Dental Congress had been a great success and he paid tribute to all those who had worked towards this end. The final report was not yet available but, in regard to the printing of proceedings, it appeared that it would not be possible to do this in book form; they would therefore be printed in the Dental Journals.

Minutes: The Minutes of the General Meeting held 25th July, 1950, were read and signed as a correct record.

Welcome to Mr. Cecil Norton and Dr. J. S. Hill: The President welcomed Mr. Cecil Norton and Dr. J. S. Hill to the meeting after their absence for some little time.

Films: The following films which had been part of the Congress programme were then screened: Dental Amalgam, Gelfoam in Oral Surgery, Silicate Cement Restorations, Pentothal N_2O Anaesthesia, Topical Fluorides.

The meeting terminated at 9.50 p.m.

AUSTRALIAN DENTAL ASSOCIATION
(NEW SOUTH WALES BRANCH)

DIRECTORY OF MEMBERSHIP, 1949-1950

SYMBOLS

(B.M.) —Blue Mountains Division.
(F.N.) —Far North Division
(N.H.R.) —Newcastle & Hunter River District Division
(N.N.W.) —North & North West Division
(N.E.) —North Eastern Division
(S.) —Southern Division
(S.C.) —South Coast Division
(S.T.) —Southern Tablelands Division
(W.) —Western Division

Note: The numerals following the street address indicate the postal zone number.

ABBREVIATIONS

KEY TO UNIVERSITY DENTAL SCHOOLS AND COLLEGES

Adl. —University of Adelaide.
Alb. —Alberta University, Canada.
Br. —University of Bristol.
Calif. —University of California.
Chic.C.D. —Chicago College of Dentistry.
Ed. —University of Edinburgh.
Eng. —England.
F.A.C.D. —Fellowship of the American College of Dentists.
F.I.C.D. —Fellowship of the International College of Dentists.
Harv. —Harvard University Dental School.
L. —University of Leeds.
Melb. —University of Melbourne.
Minn. —University of Minnesota.
N.Z. —New Zealand.
N.U. —Northwestern University, Chicago.
Ont. —University of Ontario.
Penn. —University of Pennsylvania.
Phil. —Philadelphia Dental College.
Pit. —University of Pittsburgh.
Q'ld. —University of Queensland.
R.C.S.(Eng.) —Royal College of Surgeons, England.
Syd. —University of Sydney.
Tor. —University of Toronto.
T.U.Phil. —Temple University, Philadelphia.

In this issue the list of members of the Australian Dental Association, New South Wales Branch, is presented. Please check your name for spelling, and address; forward any correction to the Secretary, Australian Dental Association, New South Wales Branch, 135-137 Macquarie Street, Sydney. Retain this issue for future reference.

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Selected Article

FEAR, PAIN AND ANAESTHESIA

PHILLIP E. WILLIAMS.

Fear is a natural human quality. Courage is the overcoming of fear, not its absence. Refusal to acknowledge fear merely emphazises its presence. Fear is constantly with us, unnoticed and unobserved. Without fear, human beings could not exist, for it keeps us from doing things that would destroy us.

It is only when the danger is new or the situation unfamiliar or immediately threatening that we are conscious of fear. It may be aroused and exaggerated also by unpleasant past medical experiences or by the words of others who have submitted to operations similar to the type about to be performed on the person concerned. Stories of great suffering endured by previous generations have undoubtedly entered into the picture.

A desire for information about a question of medical history led me, not long ago, to consult some of the first numbers of *The Lancet*, published in London in the third decade of the nineteenth century. I found myself translated to a different world: one where operations were performed without anaesthetics and without antiseptics; where any mistake in diagnosis or any clumsiness in operation was published to the accompaniment of every insult and derision which malice could suggest, and where entrance to the medical profession was through apprenticeship. It was a world where venesection was performed on everybody for everything and nursing was done by women of the charwoman class. The study of anatomy depended upon the activities of the resurrectionists, and cholera, typhus and hydrophobia were ever-present realities. Phrenology was taken seriously and there still lingered a belief in the possibility of living human beings undergoing spontaneous combustion.

What interested me most were the reports of the operations. It is difficult to believe or imagine at the present time, when even the most trivial operation is performed under some kind of anaesthetic, how our great-grandfathers

could have been induced to submit to such tortures. Our respect for their courage reaches it highest point when we read that some formidable operation was performed at "the earnest solicitation of the patient." It must be remembered that, before the days of anaesthesia, a surgeon was a man to be pointed out in the streets with the same kind of shuddering interest that now would be directed toward the public hangman.

Only occasionally is any reference made to the way in which pain was borne, and then only when it was borne well. One may take it for granted that, as a rule, an operation was performed to the accompaniment of the most heart-rending screams.

Before the days of anaesthetics, a patient preparing for an operation was like a condemned criminal preparing for execution. He counted the days and hours to the appointed time. He listened for the surgeon's arrival and watched the production of the dreaded instruments. He surrendered his liberty and, revolting at the necessity, submitted to be held or bound and helplessly gave himself up to the knife. The excitement, disquiet and exhaustion thus occasioned could not but aggravate greatly the evil effects of the operation, which fell upon a physical frame predisposed to magnify, not to repel, its severity.

There are many variations in the pain thresholds of different persons, ranging from the absolute threshold on up the scale. The absolute threshold is defined as the lowest possible limit of perceptibility of any sensation. Many persons are wont to translate the slightest sensation into a feeling of great pain. Others who have a higher threshold do not seem to express any reaction to sensations such as are produced by the insertion of hypodermic needles and grinding of teeth.

It is interesting to note that many members of the medical, dental and nursing professions possess an absolute pain threshold. When it becomes necessary for them to submit to operations of any sort, they usually subdue their apprehension for the pending ordeal by the self-administration of sedatives. They hope that the person rendering the professional services will supplement their premedication, so that their anxiety will be suppressed and they will be oblivious to pain.

One of the best ways by which a dentist may develop a real, practical philosophy concerning dental operations, such as extractions, is by having one performed on himself. This experience will give him a perspective that is most wholesome and cannot be acquired in any other manner. He will see that many little things which he regarded as inconsequential now assume tremendous proportions. So many things that were thought to be trivial now are understood to be the source of great discomfort, if not frank pain.

The eye is the index to the soul. Emotions such as fear, pain, anger and envy readily are seen therein. It is well to observe the eye of the patient during the administration of a local anaesthetic or while operating. Frequently the patient's reactions may be seen to be psychic rather than physical. This, of course, calls for the application of good psychology rather than more medication.

Too much cannot be said about pre-anaesthetic medication. Any drug which will produce sufficient hypnosis to spare the patient the dread of an operation, without endangering his welfare or creating difficulties in local or general anaesthesia, must be welcomed as a desirable adjunct to pre-anaesthetic medication. A patient's reaction to anaesthesia and surgical inter-

vention is the total of all stimuli that reach the brain. Dental and oral surgeons are apt to minimize the effect of the emotional and psychic phenomena of a patient about to undergo an operation.

That which is a commonplace experience to anaesthetists, dentists, surgeons and hospital attendants is an adventure of terrifying and surprising magnitude to a great many patients. If the patient is hospitalized, the preparation for the operation, the preliminary hypodermic injections, the change of body apparel, the trip on a stretcher to the operating room, the handling of instruments, the surgeon's scrubbing-up and, finally, the presence of the mask over the face, which gives the patient the sensation of suffocating, all produce a corresponding reaction, in many cases out of all proportion to the surgical trauma inflicted in the operating room.

Belief that the patient's respect for the surgeon's professional ability, educational background, general appearance and bedside manner is enough to relieve him of the emotion of fear and anxiety is sheer self-delusion. Employment of those medical agents that relieve and quiet the patient's natural defensive mechanism is certainly to be encouraged. Just the administration of a small dose of one of the barbiturate preparations will transform the patient from one filled with dread and terror to one who is calm and unafraid.

No attempt is made to discuss general anaesthesia in this paper. Certainly it is the answer to the proper handling of the nervous, high-strung patient who desires to be oblivious to any operative procedure. In many offices general anaesthesia has practically displaced and precluded the administration of any other type of anaesthesia. No doubt this preference will continue, and through the years the margin of safety will be increased until general anaesthesia will be as safe as the administration of any local anaesthetic.

During operative procedures performed under local anaesthesia, when the patient gives evidence of pain, although the usual signs of anaesthesia are present, it is well to believe him. Perhaps anaesthesia is not complete. Administration of just a few drops of anaesthetic solution at the proper site may make the difference between a painful experience and one that is not too unpleasant.

So many times, when conduction anaesthesia of the inferior alveolar nerve is effected, the patient may experience numbness of the lip but operative measures prove to be painful. The statements and action of the patient should not be discounted. Perhaps the cervicofacial branch of the facial nerve may be anaesthetized, causing a slight drooping of the lower lip and a tingling sensation. This has been produced by injecting the solution too far laterally and posteriorly into the parotid gland and involving the facial nerve.

When a patient alleges that he is sensitive to a local anaesthetic agent, it is well to rely on his statement. In the majority of cases, previous reactions may have been psychic, or perhaps the reaction may have been caused by the epinephrine content of the solution. However, a few persons are highly sensitive to procaine and are thrown into shock by its administration. When this occurs, the patient's behaviour is most alarming to the dentist.

It is easy to establish definitely a patient's true sensitivity to procaine by employing an intradermal test. This test consists in making three intradermal wheals on a suitable cutaneous surface, using a control wheal of physiologic solution of sodium chloride. Adjacent to the control wheal, an intradermal wheal is made with a 1 per cent. solution of procaine hydrochloride, and closely

adjacent to it a third intradermal injection is made with a vasoconstrictor, such as epinephrine or Cobefrin. After five minutes the intradermal wheals are examined. If there is any redness about the wheal produced by procaine hydrochloride, one is justified in assuming that the patient is probably sensitive to the agent. The intradermal wheal made with the vasoconstrictor naturally will be blanched for some time. If the patient reacts unfavourably to the vasoconstrictor, the objective signs of tremor, pallor and nervousness will be detected easily, and the patient will complain of such subjective sensations as faintness, palpitation and dyspnoea.

Too much stress cannot be placed on the importance of slow injection of local anaesthetic solutions. Injecting slowly will certainly obviate many of the untoward reactions that sometimes occur. It has been shown experimentally that 40 mg. of procaine per kilogram of body weight, rapidly injected intravenously, will kill a cat, but that 400 mg. of procaine per kilogram of body weight, injected slowly, may have no harmful effect. An injection given slowly requires two or three minutes to complete, whereas a rapid injection can be given in fifteen or twenty seconds.

Healthy persons usually will tolerate 175 to 225 cc. of a 0.5 per cent. solution of procaine hydrochloride, 100 to 125 cc. of a 1 per cent. solution or 25 to 50 cc. of a 2 per cent. solution of this drug. It is readily seen that, with the small amount that is usually employed, there is a tremendous margin of safety. These injections were given either subcutaneously or intramuscularly.

Toxic reaction to local anaesthetics is characterized by a drop in blood pressure, pallor, sweating, weak pulse and occasionally by nausea and vomiting. It may be of two types: (a) circulatory and (b) neurologic, which is characterized by talkativeness, excitation and convulsions.

Circulatory reactions to local anaesthetics should be treated by administration of oxygen and certain analeptic agents such as ephedrine or epinephrine. In neurologic reactions, oxygen should be administered by intermittent inflation if necessary, and a soluble barbiturate, such as sodium Amytal or Pentothal Sodium, should be administered intravenously until the reaction is controlled.

Members of no other profession, trade or craft should adhere so closely to the golden rule as should the members of the medical and dental professions. To do unto others as we would have them do unto us should be the measuring stick of everyone engaged therein. To fail to do this would be unbecoming to any practitioner of the healing arts.

The real test comes when the doctor sees his patient at some time subsequent to the operative efforts. If he has done his best, and has employed all the skill within his power, together with care, patience and consideration, he will be glad to meet his patient again. If he has been careless or negligent and has rendered inferior services, of course he will be ashamed to see his patient.

The more that is seen of life and death and of pain and suffering the more clearly it is realized that in the real world outside the walls of medical and dental schools and teaching hospitals there is never a disease to be managed or an injury to be dealt with. There is just a sick child, woman or man to be helped to recover. In short, the real business of medicine and dentistry is not science. It is, in the case of each sufferer, a personal relationship, suffused with sincerity and knowledge by the doctor and trust and dependence by the patient.—Journal of Oral Surgery, 5:141, April, 1947.

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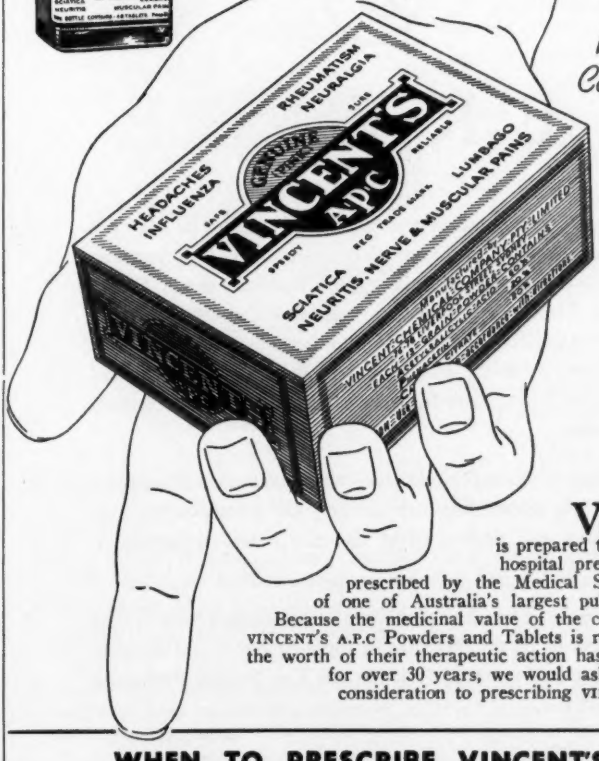

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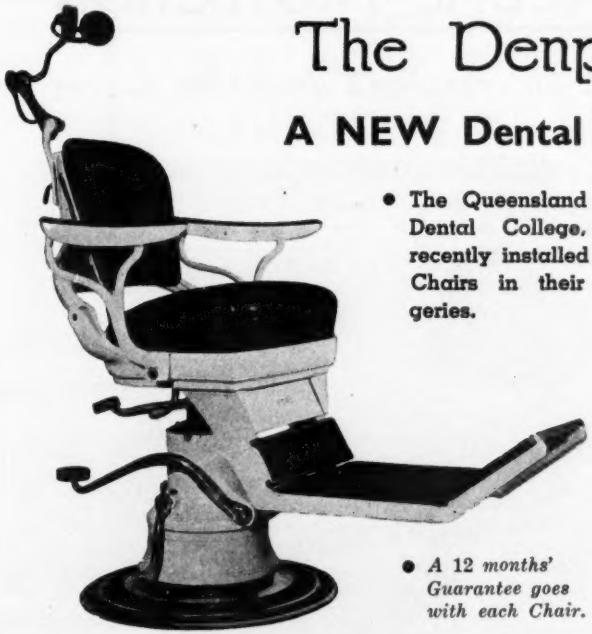

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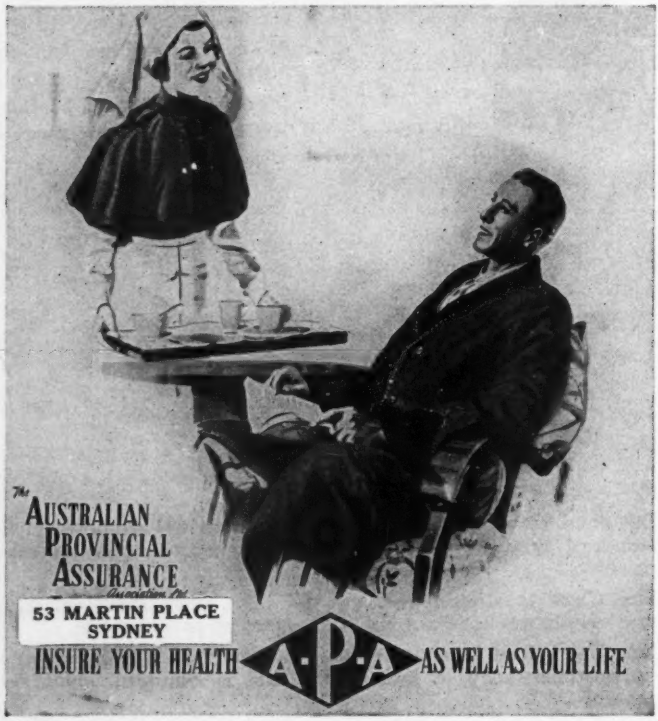

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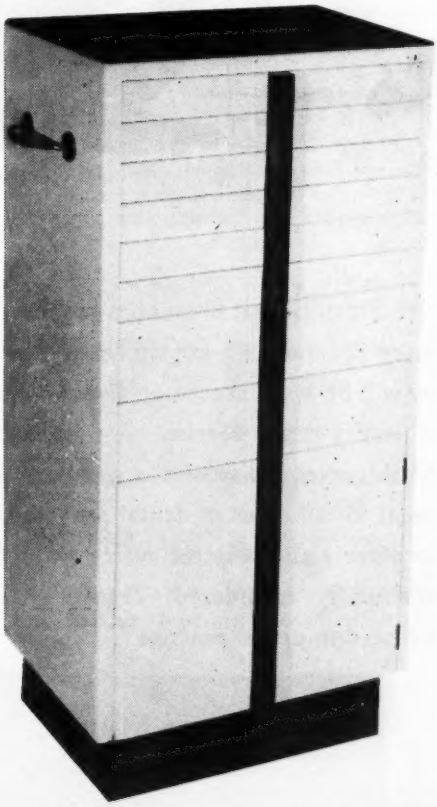

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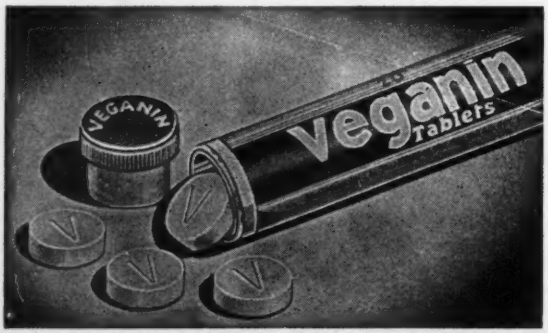

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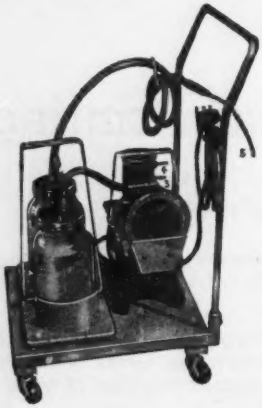

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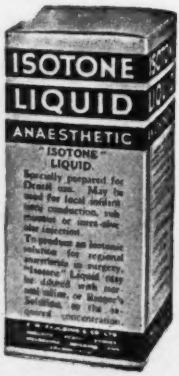

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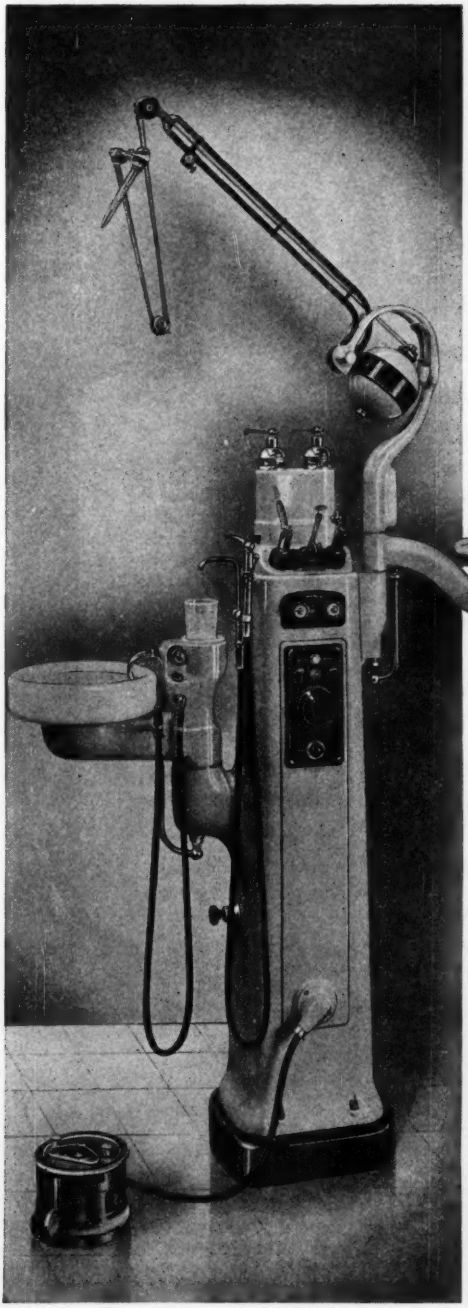

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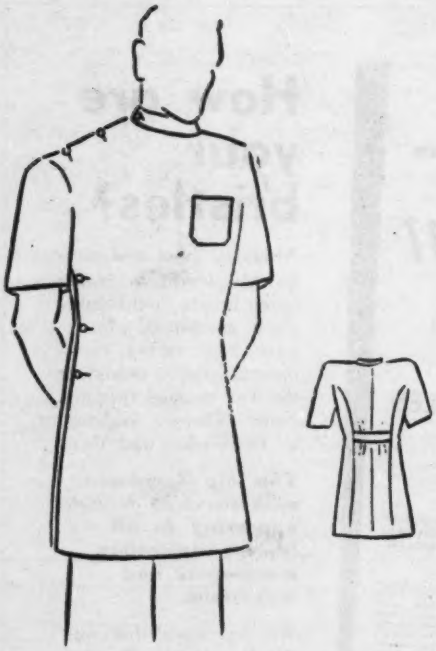

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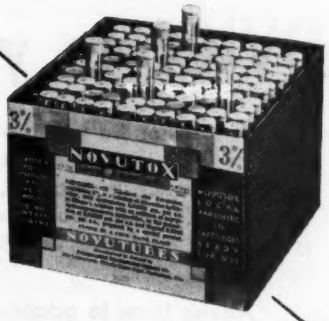

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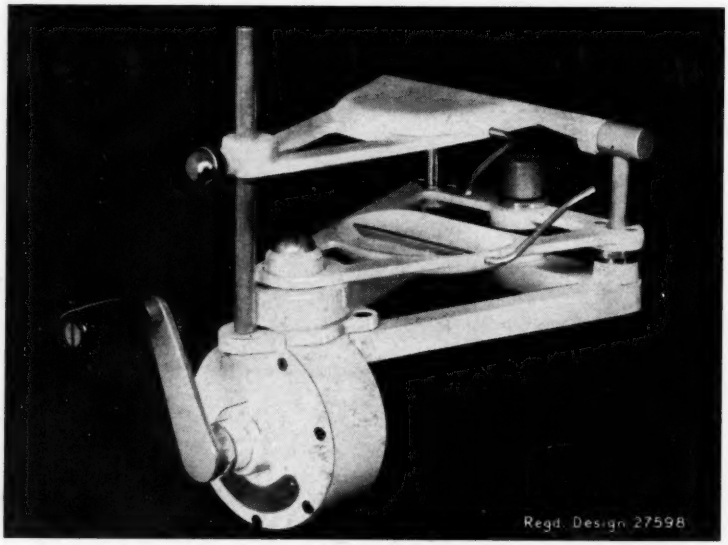

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